NYASALAND PROTECTORATE

Annual Report

of the

Department of Agriculture

1926

IMPERIAL BUREAU
23 MAR 1928
OF AGRICULTURE

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Forester	C. G. Searle.

Report of the Department of Agriculture for the year 1926.

EUROPEAN AGRICULTURE.

The agricultural statistics compiled from the returns received from European planters for the year 1926 are summarized district by district in Annexure III, and study of the figures gives a general idea of the agricultural activities of the year under review. For purposes of comparison, the total acreages of the more important crops under European cultivation in 1926 are shown below, together with the corresponding figures for 1916 and 1925.

	1916	1925	1926
Coffee	1,460	875	1,323
Cotton	27,342	17,541	13,358
Fibres	801	4,813	6,212
Rubber	6,120	1,203	1,365
Tea	4,228	5,435	5,788
Tobacco	9,386	22,415	22,908
Miscellaneous	3,546	11,073	16,211
Total ...	52,883	63,355	67,165

According to the returns of the Comptroller of Customs, the total value of the exports of European and Native-grown agricultural products amounted in 1926 to £644,928, the highest figure reached in the history of the Protectorate for any year with the exception of the boom year 1920. The values of the exports of the principal crops are given below for the years 1916, 1925 and 1926.

	1916	1925	1926
Coffee	3,285	768	2,174
Cotton	127,131	96,245	93,243
Fibres	4,056	19,388	16,799
Rubber	6,040	8,541	10,364
Tea	14,023	64,242	62,675
Tobacco	112,321	345,872	457,122
Miscellaneous	8,802	3,578	2,551
Total ...	£275,658	£538,634	£644,928

There are no means of accurately determining the value of European-grown exports as distinct from Native-grown.

Tobacco.—In 1926 European planters had under cultivation 22,908 acres of tobacco as compared with 22,415 in 1925 and 9,386 acres in 1916. Weather conditions in 1926, although far from ideal, were less unfavourable on the whole than in 1925.

Experience has shown in this country and elsewhere that the weather of the season is the dominant factor in determining the yield per acre. The task of fighting unfavourable climatic conditions is not a congenial one and may prove costly and discouraging; but there is evidence in the varying yields per acre on different estates that much could be done to mitigate the effects of a poor climatic season. The maintenance of soil fertility, the judicious application of fertilisers, the wise selection of varieties in relation to soil and climate, and the development of improved local strains of seed will all assist the planter. Guidance on these and other points is given in Bulletin No. 1, "Tobacco Culture," which was prepared by Captain A. J. W. Hornby, Agricultural Chemist, and issued during the year. Fluctuations in the market demand from year to year, as between brights and darks, has had a disturbing influence and has led to undesirable practices. Until recently a general preference was shown for "Gold Leaf"—a variety of an accommodating character that, within certain degrees, allows of the successful production of both brights and darks. The past two years in particular have demonstrated the advisability of depending in certain sections on such a variety as the Rhodesian "Hickory Pryor" for early planted brights and on a distinctly heavy class, for example, one of the Western types, for darks. To this extent the position has been clarified, but much still remains to be done in determining accurately the conditions best suited to "Gold Leaf," Rhodesian "Hickory Pryor," "Cash" and other varieties of promise.

Cotton.—In 1926 the American cotton crop reached the phenomenal figure of over 18,000,000 bales, and as a result the price fell rapidly, reaching as low a figure as 6½d. per lb. for American middling. Prices had been on the low side in the previous year, and in 1926 the European acreage under cotton crop fell to 13,358 acres as compared with 17,541 in 1925 and 26,120 in 1924.

The rapid decline in the acreage under European cotton is a matter for regret, but it is impossible not to recognize that European growers acted wisely in curtailing the acreage planted to a crop that, with the prices prevailing in the year under review, could not have given a satisfactory return on capital invested.

Present indications make it clear that as a European main crop cotton must be confined to the lower elevations of the country where the later (and comparatively bollworm free) crop is more certain than at higher elevations. In many districts cotton will find a useful place as a rotation crop for tobacco, and the cultivation of cotton for this purpose is commended to the serious attention of planters.

Tea.—The prospects of the tea industry continue to be bright, and the small increase of 353 acres under tea does not accurately reflect the interest in this crop during 1926.

Apparent limitation of new tea land in the larger tea-growing countries of the world and the increasing popularity of tea as a beverage in the United States of America should give confidence to those who are extending their acreages in Mlanje and to those who are turning their attention to the possibilities of tea in portions of the Cholo district.

An imperative need of tea growers is a suitable cover crop for smothering weeds, checking erosion, and increasing the humus content of the soil. The ideal plant for this purpose has not yet

been found, but of those imported for trial by the Department two possess advantages that justify trial by tea planters. These are the bush velvet bean and the bush lima, both of which have been under cultivation at the Makwapala station of the Empire Cotton Growing Corporation. Further importations of legumes are being made in the hope of discovering a cover crop more nearly approaching the ideal for local conditions.

Sisal.—Sisal is well adapted to conditions in the warmer portions of the Protectorate in particular, and there was a noticeable increase in the acreage planted in 1926 (6,312 acres) as compared with that (4,813 acres) under cultivation in 1925. Judged by acreage, sisal now ranks third in the European export crops of the country, and it is second according to tonnage.

Labour is difficult to obtain for work among sisal plants, but on the other hand less labour is required for an acre of sisal than for any other crop grown in the country for export, and it is encouraging to learn that further expansion of this industry is probable in the near future.

Market prices ranged around the satisfactory figure of £43 per ton during the year.

Coffee.—In the early days of the Protectorate, coffee was the staple crop, but a fall in market values, the ravages of pests, and the greater profits accruing from tobacco and cotton led to the general abandonment of coffee cultivation. During recent years interest has revived in this crop, especially as supplementary to tobacco; and in 1926 the acreage planted to coffee amounted to 1,323 acres as compared with 875 in 1925. The highest acreage recorded in the past, in the young days of the Protectorate, was 16,917 acres in 1900.

Climatic conditions in this country are not ideal for coffee, owing to the long dry spell in the winter months, but the crop fits in well with tobacco, and, at prices that have ruled for several years past, good returns may be expected.

A note of warning is, however, necessary. Success with coffee depends in this country on a vigilant and constant war against pests and diseases. Undue discouragement need not result from this fact as planters are no longer handicapped by the lack of knowledge on this subject that prevailed in the past. To-day, guidance may be obtained from the Government Entomologist as to the best measures for combating the major pests of coffee.

Nyasaland coffee growers follow the Indian and West Indian method of pruning, which is based on retaining a single main stem; in Kenya and in Uganda there is a movement in favour of the multiple stem systems of pruning popular in Central America. Experimental trial of these systems is highly desirable, and I would especially recommend trial of the Agobiada or Guatemala method. After the young plants have recovered from transplanting to the fields, the stem is bent down until the tip is near to the ground; and the stem is kept in that position by a hooked stick. Shoots will develop from near the base, and two or three of the strongest of these should be allowed to grow to replace the main stem, which in due course is cut off.

Coffee growers here, as elsewhere, demand an authoritative statement on the question of shade. This, I frankly cannot give, nor have I known any country where the subject is not, even after years of experience, still a matter of controversy. In fact it is not uncommon to see in coffee-growing countries one planter cutting out his shade trees while a neighbour not far off is planting shade trees through his coffee, both being convinced of the wisdom of what they are doing. This much can be said: shade is not imperatively needed under average conditions in Nyasaland.

Rubber.—Growth of this crop is still confined to the Vizara estate in the West Nyasa district, and the production for the year amounted to 171,623 lbs. as compared with 155,925 lbs. in 1925. Prices for this commodity reached over 4s. per lb. during the year.

NATIVE AGRICULTURE.

The relative progress of the production of cotton and tobacco by Natives, as compared with European, is shown by the following figures:—

	Percentage of Total Production	
	Cotton	Tobacco
1915	11	6
1924	35	14
1925	63	33
1926	74	41

Cotton.—The native cotton crop was 2,197 tons of seed cotton in 1926 as compared with 2,909 tons in 1925. Although this reduction in output is disappointing, the production for 1926 is a large increase over the native cotton crop of any previous year with the exception of 1925. The native cotton crops for the whole country for the years 1920 to 1926 are shown below, together with the production in administrative districts in 1925 and 1926.

	Seed Cotton (Tons)
1920	315
1921	375
1922	387
1923	747
1924	1,369
1925	2,909
1926	2,197

District	1925	1926
Lower Shire	1,692	1,266
Chikwawa	454	571
Central Shire	153	165
Mlanje	85	89
Blantyre	—	25
Ncheu	99	34
Liwonde (Upper Shire)	62	3
South Nyasa	142	12
Dedza	51	20
Dowa	12	12
Kota-Kota	1	—
Karonga	158	—
Total ...	2,909	2,197

The lower production of 1926 as compared with 1925 is due to several causes:—

1. The yields per acre of 1926 were not equal to those of 1925, a year when weather conditions were peculiarly favourable.
2. The fall in price had a discouraging effect on the natives.
3. Tobacco has been grown instead of cotton by many natives at elevations where the growth of either is optional.

Examination of the production in the different districts reveal the disappointing fact that only a negligible quantity was grown by natives in districts other than Chikwawa, Lower Shire and Central Shire. The continued success of cotton growing at Lisungwe in the Central Shire is due largely to the enthusiasm and influence of Chief Simon, and indicates what can be done by a chief with progressive ideas.

Under their agreement with Government, the British Cotton Growing Association paid the approved prices of 1¾-2d. for No. 1, 1¼-1½d. for No. 2 and ¾d. for No. 3 cotton grown by natives on Crown Land, and the total distribution of money to native cotton growers amounted to £35,037 in 1926.

Acknowledgement is again due to Mr. J. A. Lee, local manager of the association, for his untiring efforts to ensure the smooth and successful working of the agreement with Government.

Tobacco.—Expansion of the native tobacco industry has been very rapid in the past four years, as shown below:—

Year.	Yield Tons.	Year.	Yield Tons.
1923	100	1925	1,176
1924	525	1926	2,023

Production in administrative districts 1925-1926.

District	Yield Tons		District	Yield Tons	
	1925.	1926.		1925.	1926.
Cholo	17	68	Dedza	17	37
Mlanje	218	270	Lilongwe	166	506
Blantyre	249	105	Dowa	26	374
Chiradzulu	278	388	Kota-Kota	2	60
Zomba	193	121	West Nyasa	—	4
Upper Shire	—	9	North Nyasa	—	5
South Nyasa	—	10			
Ncheu	11	66	Total... ...	1,177	2,023

Registration of native tobacco growers came into force in 1926, and the number of natives registered for the 1926-1927 season were:—

District	Number of Natives	District	Number of Natives
Mlanje	7,000	Dedza	3,000
Cholo	1,500	Lilongwe	13,300
Blantyre	2,000	Fort Manning	3,000
Chiradzulu	9,100	Dowa	9,000
Zomba	5,300	Kasungu	1,100
Upper Shire	1,150	Kota-Kota	1,000
South Nyasa	450		
Ncheu	2,750	Total...	59,650

The problem with which Government has been confronted has not been the devising of means to encourage natives to grow tobacco but rather the evolution of measures to ensure the production of tobacco of good quality, as many of the large numbers of natives who have recently taken up this crop are unfamiliar with the ordinary practices of tobacco cultivation and curing.

In April, 1926, a Native Tobacco Board was appointed, with the Director of Agriculture as chairman, to assist and supervise native tobacco growers.

Food Crops.—Weather conditions were on the whole favourable for the growth of food crops throughout the country, although some damage to these crops resulted from excessive rains in the Dedza district and from floods in the Chikwawa and Lower Shire districts. In the South Nyasa district a difficult position has been created by the high water level of the Malombe Marsh, which has deprived many natives of the use of fertile tracts of land on the borders of the marsh that have been used in the past for the growth of considerable quantities of food stuffs.

In spite of shortages in localized areas, the supply of food proved adequate for the needs of natives in their villages, but concern must be felt at the narrow margin of safety in a year when weather conditions were in general reasonably good. Neither Government nor Europeans could obtain sufficient maize from native growers to meet all their requirements, and it proved necessary for planters and other employers of labour to import 2,632 tons of maize, valued at £17,618, from Southern Rhodesia and the territory of the Mozambique Company. It is possible for the natives of Nyasaland to produce with ease and at a profit all the maize required for local consumption in addition to that grown by Europeans, and it is economically unsound that over £17,000 should be expended on the importation of maize.

Unless larger acreages are planted with maize, excessive prices in the native markets will continue to be charged to natives living in and near townships, and in a year of unfavourable weather conditions famine conditions must inevitably prevail.

Report of the Agricultural Chemist.

Continued attention has been given to the needs of the tobacco industry by the Agricultural Chemist, who now devotes more time to tobacco investigations and advisory duties than to routine laboratory work. Captain Hornby returned to the country in March, having devoted the greater

part of his leave to the study of tobacco culture in the United States of America. In Bulletin No. 1 (1926) is a full account of the impressions he gained in America; methods of cultivation adopted there are compared with those common in this country, and the bulletin has been prepared in such a manner as to form a useful guide to tobacco growers.

In his report for the year under review (Annexure I) the Agricultural Chemist gives the results of various investigations and draws attention to matters of practical importance to tobacco growers.

Report of the Government Entomologist.

Much information of interest will be found in the report of the Government Entomologist, who during the year devoted much time to the study of the life history and habits of the "mosquito" bug on the tea in Mlanje. During his visits to Mlanje, Captain Smee also interested himself in the tea diseases found in the district; this work was of special importance, as it was done in anticipation of the visit of Dr. Butler with the two-fold object of facilitating his investigations and of ensuring that the Department, although without a mycologist, would be enabled to follow and derive the fullest benefit possible from Dr. Butler's investigations.

The notes on coffee pests and diseases in Captain Smee's report will be of value to those who are engaged in the cultivation of this crop.

Tobacco Field Experiments.

Economies effected in 1923 resulted in depriving the Department of the personnel necessary for conducting experimental work with tobacco on anything like an adequate scale. To overcome this handicap, negotiations have been in progress for some time past for the acquisition of a block of land near the agricultural offices that could be supervised without entailing the appointment of a resident officer. Towards the end of 1926 a land exchange was effected by Government with the Blantyre and East Africa Company, which gives the Department possession of thirty acres of land in the close vicinity of Zomba, and tobacco investigations have been started under the supervision of the Agricultural Chemist.

Arrangements are also being made with the Empire Cotton Growing Corporation for the extension of their tobacco plots, which now form part of their rotation scheme, and for the introduction of a series of tobacco experiments that will enhance the usefulness of the station without in any way interfering with the cotton experiments.

Our Department will then have two sources, in different soil and climatic zones, from which tobacco experimental data may be collected, and where varietal tests may be made and improved strains of seed developed.

The composite scheme outlined above is an indirect, and in some respects unsatisfactory, method of pursuing obviously desirable work on the most important crop of the country, but is the best within the means of the Department.

District Agricultural Work.

Instruction was given to natives in the cultivation of food crops and cotton by the district agricultural officers attached to the Department, but the work was much interrupted owing to the absence on leave of these officers for a part of the year. Instruction in the cultivation of tobacco was given by the agricultural supervisors of the Native Tobacco Board.

Empire Cotton Growing Corporation.

Continued progress has been made by the branch of the Empire Cotton Growing Corporation stationed in this country in their trial of strains and varieties of cotton and in their experimental work with rotation crops.

Seed of the promising new variety "Over the top" has been multiplied and arrangements made for ten bulk observation plots scattered throughout the country from Fort Johnston southwards.

An important feature of the activities of the Corporation staff during the year has been the development of an experimental station at Port Herald where cotton and rotation crops are being grown under conditions comparable with those prevailing on the Lower River—the section of the country where the bulk of the European and Native-grown cotton is now produced.

My thanks are due to Mr. H. C. Ducker, Cotton Specialist, for his ready co-operation in matters relating to the work of the Corporation and the Department.

Veterinary and Forestry Divisions.

The work of the Veterinary and Forestry Divisions has been reported on in detail by the Acting Chief Veterinary Officer and the Acting Chief Forestry Officer, and calls for no special comment on my part. The veterinary report is attached as Annexure V.

Agricultural Show.

The annual Agricultural Show was held on the 1st July in Blantyre, and the exhibits were very much of the same standard as the previous year. For one reason or another our agricultural show does not make the appeal to possible exhibitors that might well be expected, and I would urge all planters, as members of an agricultural community producing crops that justly have a good reputation on the home market, to throw themselves more heartily into the task of making the annual show an outstanding success and more truly representative of the agriculture of the country.

On the day after the show an agricultural conference was held at which His Excellency the Acting Governor presided.

East African Agricultural Conference.

The Director of Agriculture and the Government Entomologist, together with the Cotton Specialist of the Empire Cotton Growing Corporation, attended the East African Conference which was held at Nairobi in August.

A wide range of subjects of interest to those engaged in agricultural work in East Africa were discussed and visits were paid to various agricultural centres of Kenya.

It is not possible to estimate the immediate and direct benefits of the conference, but at the close the delegates left feeling that important information had been acquired, that new lines of work had been suggested, and that the foundation had been laid for closer co-operation between the various branches of the agricultural services of East Africa.

Publications.

During the year five agricultural publications were issued by the Agricultural Division of the Department, and a list of these, together with the publications since 1922, is given in Annexure IV.

Staff.

The following officers of the Agricultural Division were absent on leave during the year: Mr. E. W. Davy, Assistant Director, 30th October to 31st December; Mr. F. Barker, District Agricultural Officer, 6th July to 31st December; Mr. N. D. Clegg, District Agricultural Officer, 1st January to 8th October. Thanks to the generosity of the Empire Cotton Growing Corporation, Mr. Clegg was able to take a special and extended course at the North Carolina Experiment Station. Mr. Barker devoted a portion of his leave to study at the Royal Botanic Gardens, Kew, and at the Imperial Institute, London.

Owing to the absence of the Assistant Director for the latter portion of the year, there is no report this year on his work, which included the varied duties attached to his post as well as those that would fall to the lot of the Economic Botanist in a fully staffed Department.

In conclusion, I take great pleasure in acknowledging the good work performed by the officers of the Department during the year under review.

E. J. Wortley,
Director of Agriculture.

Annexures.

I—Report of Agricultural Chemist.
II—Report of Government Entomologist.
III—Agricultural Statistics, 1926.
IV—Publications 1922-1926.
V—Report of the Chief Veterinary Officer.

Report of the Agricultural Chemist.

I returned on January 4th, 1926, from leave of absence, the greater part of which was spent in studying at the experimental stations in the United States recent results in agronomic research with especial reference to tobacco soil surveys, chemistry and diseases. A full report was issued during the year.

GENERAL FIELD WORK.

During the year I have visited all parts of Nyasaland, 1,500 feet above sea level and upwards, to investigate areas where tobacco is likely to take its part in a *permanent agriculture*. It is my aim to encourage tobacco growing in these areas where problems relating to yield and quality should be solved by field and laboratory experiments on the lines of Dr. Garner's work. It is quite obvious that, with over-production (the one greatest menace to profitable tobacco culture since the earliest days of settlement in Virginia), tobacco will cease to be grown in areas with a greatly fluctuating and high rainfall and where low yields are prevalent. The results of field experiments are often not applicable to such areas. I must deplore the way that many growers grow dark varieties for fire-curing in one season and bright varieties for flue-curing in another season on the same soil in order to satisfy some local buyers. How can this lead to the production of a crop of high quality? Such a crop is the result of careful rotations and manuring in a regular farm programme, and the programme is always quite different for a dark-fired and for a flue-cured tobacco crop on any one soil.

As an example of an area near the Lake shore where the soil and climatic conditions similar to those in areas in S. Carolina may be considered suitable for bright tobacco culture, the following data may be given as far as records go. (The selection of soil in such areas is of great importance, however, and attempts to grow bright tobocco on fertile clay loams should not be made.)

	TEMPERATURE.				PRECIPITATION.		
Month	Mean maximum	Mean Minimum	Absolute Maximum	Absolute Minimum	Mean 1911-26	Total for Driest Year	Total for Wettest Year
Dec. (Growing period)	88.9	74.4	99	62	6.79	0.86	11.
Jan. ,,	91.5	69.6	99	66	5.27	6.27	8.7
Feb. ,,	87.6	69.1	99	68	5.75	7.64	3.3
March (Harvesting period)	90.6	69.0	98	60	8.33	6.75	15.3
April ,,	88.5	69.2	98	56	4.25	6.43	5.45
May ,,	89.3	69.6	97	55	0.51	1.11	0.95
June	83.8	68.6	97	53	0.20	0.05	nil
July	86.1	61.3	90	55	0.07	nil	nil
August	84.9	61.3	91	49	—	—	—
Sept. (Seed-bed period)	86.5	65.6	98	49	—	—	—
Oct. ,,	91.1	68 6	98	60	0.11	nil	nil
Nov. ,,	92.3	71.0	99	63	0.40	nil	0.45

Elevation 1,650 feet.

It will be obvious on comparison with similar figures for the growing season in the Carolinas that areas with similar conditions are more suitable for the production of bright tobacco of high quality than many of the Highland areas.

It may incidentally be mentioned that vegetation surveys should go hand-in-hand with soil surveys, as it is quite obvious in these interesting areas that the value and adaptability of soils to certain crops may be ascertained by the associations and societies of different plant species on those soils, especialy as regards texture, acidity and available phosphates. Vegetation studies, however, are generally outside my province. I notice that methods of maintaining and improving fertility and quality of tobacco have been largely adopted on certain soil series, e.g., Likangala, but it is with grave apprehension that I note the following methods are still adopted by certain farmers:—

(*a*) Clearing of large uninterrupted areas of forest land.
(*b*) No provision of recognized methods of preventing soil erosion.
(*c*) Entire lack of rotations.
(*d*) No use of manure or fertilizers.

It is a case of soil capital being exhausted by a bad system of farming, and doubtless the way estates on Crown Land frequently change hands or managership can never lead to a permanent productiveness of good quality crops.

It may not be generally recognized that over 60 per cent. of these estates have so changed in the past five years. Reduction of rents where the soil is well managed may serve as an incentive to better farming or, as in Java, Government should require conditions to be fulfilled, such as the provision of a suitable system of terraces, combined with surface drainage, before forest lands are planted.

The need of drainage maps from the point of view of future crop production, soil erosion, irrigation and the interdependance of railways, etc., is pointed out in "Crop Production in India, 1925," and applies equally to Nyasaland. Reports on soil series and types will be published from time to time as hitherto.

The Nitrogen Problem.

This problem in Nyasaland is one of the most important, as the losses are so obvious and many. The supply of nitrogen is often the determining factor in growth during the average growing season in the Highlands, this season having an average monthly rainfall much greater than the above figures.

The lines on which this problem is being tackled are :—

(*a*) Supply of nitrogen and organic matter in rotations as in Bulletin No. 2 of 1924 (Likangala series) and maintenance of the balance between nitrogen and other constituents for bright tobacco soils.

(*b*) Intelligent use of application of soluble nitrogen salts before planting and to the growing crop. Yields in many cases have been doubled by the latter.

(*c*) Inoculation of roots of newly introduced leguminous plants by cultures at sowing. Cultures were obtained from the U.S.A. and used successfully on soya beans, lucerne and clovers.

(*d*) Better utilization of organic residues, such as cattle manure and cotton seed.

(*e*) Use of highly concentrated synthetic fertilizers and their effect on quality. In this connection synthetic urea, with 46 per cent. nitrogen and Diammonphos, with 20.6 per cent. nitrogen and 52.5 per cent. phosphoric acid, are being used on tobacco this season. With a unit value of 17s. for nitrogen at Limbe, they are the cheapest of nitrogenous fertilizers.

(f) Nitrification and liming.

Laboratory work has included investigations into the rate at which the nitrogen is rendered available on a typical Ntondwe sandy loam. Results are as follows in pounds per acre of nitrate on mulched soil :—

Sulphate of ammonia per acre	lbs. nitrogen added	Nitrate in Soil	After 12 days	After 6 weeks	After 10½ week
1. nil	—	27	27	46½	48½
2. 300 lbs.	63.6	27	31½	77	88½
3. 300 lbs.	63.6	27	30½	85½	87
4. 300 lbs.	63.6	27	30½	96	95½

Nos. 1 and 4 received 2,000 lbs. of lime to the acre, which obviously accelerated nitrification very little. Further experiments on the same lines proved that half the nitrogen supplied as sulphate of ammonia is converted into nitrate after 40 days when the soil moisture is kept at 10 per cent. only.

Absorption by Soils of Ammonia applied in Fertilizers.

The following figures were obtained in the course of investigations into the loss by leaching of applying ammonia salts to bright and dark tobacco soils :—

Experiment 1 : 100 grammes of several types of soil were treated with 200 cc. 1/10 per cent. solution of ammonium sulphate for two hours, with frequent stirrings. The mixture was filtered after two hours.

Soil	Ammonia added	Found in filtrate	absorbed	Per cent. absorbed	Per cent. lost
Tuanjati sandy loam	51.6 mg.	24.8	26.8	51.9	48.1
Ntondwe red loam	51.6 ,,	22.7	28.9	56.0	44.0

Experiment 2 : 100 grammes of same two soils treated with 200 cc. of 1/10 per cent. solution of ammoniun sulphate for 24 hours :—

Soil	Ammonia added	Found in filtrate	Absorbed	Per cent. Absorbed	Per cent. lost
Tuanjati sandy loam	51.6	22.7	28.9	56.0	44.0
Ntondwe red loam	51.6	21.9	29.7	57.5	42.5

Experiment 3 : 2 grammes of the sulphate of ammonia was then mixed with 100 grammes of each of the soils and 200 cc. water added little by little with stirring. After two hours the solutions were filtered, and the filtrates analysed with the following results :—

Soil	Ammonia added	Found in filtrate	Absorbed	Per cent. absorbed	Per cent. lost
Tuanjati sandy loam	51.6	29.9	21.7	42.1	57.9
Ntondwe red loam	51.6	23.7	27.9	54.2	45.8

Experiment 4 : This experiment was to ascertain the amount of fertilizer leached from an average tobacco soil with which it was incorporated when a quantity of water equivalent to two inches of rainfall was added during two hours.

Sixty-five grammes of fertilizer was incorporated with the upper three inches of various soils and 600 cc. of water was added, which was in every case absorbed. Twenty-four hours afterwards a further 300 cc. of water was added, and the water percolating through was analysed. All of the ammonia was absorbed by these soils, initially dry. Similar results were found for Diammonphos or ammonium phosphate ; but in the case of nitrate of potash applied in a similar way, only 93 per cent. was absorbed by the upper three inches of soil with three inches of rainfall.

The above experiments show that ammonia salts are absorbed by Nyasaland soils to the same extent as by similar Ceylon and Mauritius soils (see 1926 Bulletin No. 75 of Ceylon Department of Agriculture), and the advantage of using such ammonia salts instead of the more easily leached nitrate fertilizers for our growing season should be borne in mind. The need of further lysimiter experiments on these lines through a growing season are obvious. Reference may here be made to the loss of over 29 per cent. of nitrate nitrogen during a few days in mid-January as reported in Bulletin No. 2 of 1925.

The accumulation of nitrate on well cultivated land during our dry season is seen in the following figures obtained during September and October, 1926. Average number of pounds per acre of nitrogen in nitrate form and therefore directly assimilable by plants (nine samples of each) :—

Well and early cultivated land ... ... 27½ lbs.
Badly worked soil ... ... 11½ lbs.

A further example of the difference in nitrate accumulating on cultivated soils of different age is seen herewith (pounds per acre of nitrogen as nitrate) :—

Newly-opened virgin soil ... ... 9.8 lbs.
Land after 4 years in cropping 19.1
,, ,, 1 year ,, ... 33.8
,, ,, 2 years ,, ... 24.

Treatment and origin were very similar during the dry season of 1926. The difference in growth on land of these different ages is thus explained.

It is obvious as a result of these investigations that more attention should be paid to early dry-season cultivation to promote nitrification and aeration for tobacco growing.

TOBACCO INVESTIGATIONS.

Absorption of Nitrogen by the Tobacco Plant.

The tobacco plant absorbs most of its nitrogen as nitrate, and the requirements for this element are high.

I have carried out experiments regarding the manner in which the tobacco plant absorbs its nitrogen, and find that under similar soil and climatic conditions the absorption goes on in a similar way to that in the American Old Belt.

The acquisition of a plot of land for experimental purposes in Zomba will now make it possible to gain further information on these lines, together with information regarding water supply and root development under healthy and root disease (eelworm) conditions.

The following table shows results obtained with a series of plants grown in the same seed-bed and planted out together. The plants were taken at intervals during growth up to the period when they showed true ripening. Thirty-six days after topping and 97 days after late planting out, the ripe bottom leaves were removed. Urea was applied after planting out.

The figures show the milligrams of nitrogen found in leaves, stems and roots. Variety used was Melton. Seven leaves were taken at each sampling after topping.

	Leaves	Stems	Roots
80 days from sowing	27.7	4.12	5.76
93 ,,	69.6	7.12	6.58
118 ,,	350.1	28.4	44.0
130 ,,	725.	85.8	87.8
150 ,,	1,219.6	137.0	235.5
160 ,,	1,676.4	—	—

Full details of this and other experiments and of results with plants showing true, false and starvation ripening under varying seasonal conditions will be published in course of time. The absorption of nitrogen during the true ripening is shown to be high, but naturally when the plant is topped and the characteristic ripening of the Bonanza varieties (e.g., Hickory Pryor of Rhodesian origin) is exhibited a few days afterwards, or when harvesting of lower leaves takes place before topping with kindred varieties which are grown for coloury tobacco with little body—there is very little absorption of nitrogen by these varieties in the later periods of growth, The percentage of nitrogen is comparatively small in such leaf.

As regards the influence of small side applications of nitrogen to tobacco in the field, it is not thought that this will influence the aroma of tobacco to any extent. In this connection the following communication from Dr. Garner may be cited: "I am still inclined to the view that the resins are the most important group of constituents influencing aroma."

Side Applications of Nitrogen Fertilizers.

The table herewith shows the increases in yield which have been obtained with small applications of ammonia and nitrates to tobacco in the field. This practice was commenced by me in Nyasaland in 1921. Good results have more particularly been obtained with varieties of the Bonanza class like Hickory Pryor of Rhodesian orgin, doubtless due to lower demand for nitrogen in comparison with dark tobacco varieties.

As I have pointed out elsewhere, *colour is more easily obtained* with the Bonanza class with smaller applications of phosphate, and when the characteristic ripening occurs.

In applying the mixed fertilizers to soil types according to the formulas recommended, it is now often the custom to apply phosphates, potash and organic nitrogen before planting and the soluble nitrogen compounds after. Some planters, however, who are well aware of the effect of judicious applications of soluble nitrogen must, owing to the shortage of labour, apply compound fertilizers before planting and hope for a rainfall similar to that during the average growing season in South Carolina.

Year	Soil Series	Fertilizer	lbs. per acre		No Ammonia plot lbs. yield per acre	Ammonia plot lbs. yield	Increase
1921	Cholo	Sulphate of Ammonia	100	L	328	403	75
1921	Ntondwe	,, ,,	75	L	786	854	68
1921	Cholo	,, ,,	75	L	391	511	120
1922	Ntondwe	,, ,,	75	E	549	570	21
1922	Likangala	,, ,,	100	L	432	510	78
1922	Ntondwe	,, ,,	100	L	213	236	23
1923	Likangala	Nitrate of Potash	112	E	496	589	93
1923	,,	Nitrate of Lime	122	E	496	620	124
1923	,,	Nitrate of Soda	100	E	496	580	84
1923	Ntondwe	Sulphate of Ammonia	50	L	420	490	70
1923	,,	Nitrate of Lime	150	L	330	296	—34
1923	,,	Nitrate of Soda	100	L	322	655	333
1924	,,	Nitrate of Lime	100	L	402	498	96
1924	,,	Nitrate of Potash	100	E	402	531	129

L late planted E early planted

Much was learnt during these trials as to the correct time of application for bright and dark tobacco, especially from the point of view of the nature of the soil and rainfall. Side applications to tobacco in the field about 14 days after planting out may, when climatic conditions similar to those of S. Carolina (described above) are met with, lead to too much darkening of colour of bright tobacco. On the other hand, when a high rainfall is encountered in the Highlands it is often necessary to give side applications as above up to 20 days after planting out to ensure a profitable yield. I gave a limit of 12 days after planting out bright tobacco in 1923 (see Circular No. 3 of

1923) beyond which ammonia should not be given as a side application, but my experience in subsequent abnormal wet seasons has shewn that this limit may be extended.

The increase due to the above applications of nitrogenous fertilizer is about 80 lbs. per acre. In most cases there was decided improvement in quality, and the average increase in acre value of the tobacco was more than £4. The cost of the small applications averaged 17s. an acre, but the reduced cost of these applications and the increased knowledge of nitrification and fluctuations in the nitrogen supply to the plant have increased the profit per acre to a large extent during recent years. Even in 1921, two plots receiving ammonia yielded 1,080 and 1,010 lbs. per acre in comparison with 578 lbs. per acre for the plots receiving no ammonia but similar potash and phosphate. In 1926, the profits on an acre of tobacco due to sulphate of ammonia were £9 to £10 an acre greater than the profits on an acre unmanured.

It is hoped soon to have the facilities for dealing more carefully with yield, so that the amount, number and value of the different grades from each plot may be carefully estimated and the increase in profit accurately told. This is a matter entirely for an experimental station supervised by a whole time investigator as in America.

Ripening.

Much attention has been paid in the field to the false ripening, as I have called it. This may be exhibited largely by special varieties, or is due to nitrogen or magnesia hunger due to excessive rainfall, and there is no large starch accumulation in the leaves such as is characteristic of the ripening of nearly all American bright tobacco. The smaller amount of starch in some Nyasaland tobacco leaves has been well brought out by analyses. At lower elevations more suited to tobacco growing, and with a smaller rainfall, true ripening is usually seen with standard varieties. It is obvious from the superior growth of certain varieties in some high level districts and from the characteristic way they ripen that most successful results should be obtained from acclimatized varieties cross-fertilized from Burley and standard varieties (such as those of the Bonanza class, Hickory Pryor, etc.).

At elevations lower than 2,800 ft. above sea level, which are most suitable for bright tobacco growing, the superior results obtained in some years—when ripening goes on in a fairly dry month as in America—should be compared with the early planting, which often means ripening in a wet March. This especially applies to the Lake area, and deserves thorough investigation. The growing of varieties for seed production should be on a station at about 2,200 ft. The narrowing of the leaf, etc., at much higher elevations is obvious owing to the checks in growth through extreme changes in temperature and plant food.

The effect of available soil phosphates on ripening and colour of standard varieties of tobacco has been studied. The optimum ratio of phosphoric acid to nitrogen in the supply of plant food to a standard bright tobacco crop should be eight to three.

The influence of phosphates on root development, fibrous tissue, quality, resistance to diseases and hastening maturity is well brought out on some soil series such as Tuanjati, Vua and Lintipe, whose richness in available phosphorus has been confirmed in 1926 by soil analyses and field tests.

In the latter connection, I have in field work adopted Shedd's test and found it particularly useful (see "Soil Science," Vol. XL, No. 2, February, 1921). Similarly, in this extension work I have adopted for soil acidity, Comber's test, using 60 per cent. methyl alcohol, 40 per cent. acetone as the organic solvent (see Journal Amer. Soc. Agron., July, 1925). This gives very useful indications for lime requirements of Nyasaland soils. Five hundred of these tests have been carried out after correlation with other determinations.

Fertilizer Formulas.

Conclusions from soil work are that the fertilizer formulas given for several mature soil types may still be adopted, with the exception that the phosphorus may be reduced for Tuanjati soils and may be almost dispensed with on these soils for Hickory Pryor and similar kinds whose feeding powers and ripening are different to the standard varieties. Muriate (chloride) of potash is being used on Nyasaland soils. It is clear that small dressings on sandy soils in the average season will not harm the burning quality when the chlorine content of leaf and the district rainfalls are considered. The general rule should be, however, that fertilizers be compounded so that they contain not more than one unit of chlorine for two units of potash to maintain good burning qualities. I have in fertilizer mixtures recommended organic filler such as cotton seed meal to prevent caking and promote even distribution of fertilizers.

Prices of Tobacco Fertilizers.

Efforts were made during the year to persuade planters to buy fertilizers in the cheapest market, and an attempt was made by the Zomba planters and myself to buy co-operatively, which led to a combined order with considerable saving. The following comparative prices between Southern Rhodesia, 1925 (see Chief Chemist's Annual Report) and lowest prices paid by Nyasaland planters in 1926 are of interest. Agricultural chemists naturally are in favour of co-operation amongst planters, both from the point of view of marketing of produce and that of purchasing requisites such as fertilizers.

	1925 per ton of 2,000 lbs. f.o.r. Durban			1925 per long ton delivered and paid at Limbe		
	£	s.	d.	£	s	d.
Urea (46 per cent. Nitrogen)		—		... 34	10	0
Sulphate of ammonia	19	10	0	... 19	0	0
High grade superphosphate 17.1 per cent. P_2O_5	4	10	0	... 7	10	0
Double superphosphate 40 per cent. P_2O_5		—		... 17	10	0
Diammonphos 20 per cent. N. 53 per cent. P_2O_5		—		... 29	11	6
Sulphate of Potash	13	15	0	... 17	0	0
Muriate of Potash	12	15	0	... 15	10	0
Double tobacco fertilizer	19	0	0	... 19	12	0
Nitrate of Potash		—		... 30	10	0

The advantage of purchasing fertilizers in South Africa is not clear. It is interesting to note that Nyasaland is the first country in Africa to use on a large scale the new synthetic fertilizers manufactured in England and Germany from atmospheric nitrogen. The prices paid by Nyasaland planters are, comparatively, not high, although some will persist in paying too much and not utilize the special knowledge possessed of the manufacture and marketing of these fertilizers. I must report a distinct lowering in price paid by intelligent planters during recent years. The difference in prices of fertilizers between May, 1923, and to-day will be seen on comparison with leaflet D of 1927.

Other Aspects of Tobacco Culture.

Innovations brought in recently dealt with were :—

(*a*) Disinfection of seed followed by washing and direct sowing (Bulletin No. 5 of 1923; Seed-beds). In this connection treatment with 1/1000 silver nitrate has been shewn to be superior to the treatment with corrosive sublimate.

(*b*) Seed-beds: watering before burning seed-beds for proper sterilization and control of eelworm. Use of chemicals on seed-bed soil for the latter purpose has not proved successful.

The carriage of the damping-of organisms on transplants with subsequent damage in the field has been pointed out by me. Thorough sterilization and aeration of beds is recommended. The experimental area now acquired has enabled us to start rotations for the study of eelworm carry-over in field soil.

(*c*) Curing.—The use of a "Sapping" method in curing for diseased leaf. This prevents leaves infected in the field with certain organisms from developing disfiguring spots and pole-burn (see *Nyasaland Times*, March, 1923).

(*d*) Increase in weight when leaves cured after picking leaf by leaf, compared with leaves cured on the stalk after splitting and cutting. This method of priming is now preferred by many growers in Nyasaland.

(*e*) Soil Fertility.— The small increases on Nyasaland soils due to applications of sulphate of potash indicate that the limit, below which deficiency of potash is shown when a soil is extracted with 1 per cent. citric acid, is about .017 per cent. for Nyasaland tobacco soils. The usual limit for phosphoric acid as given by certain authorities on these soils is, however, too small.

(*f*) The ratio of total lime to total magnesia has little to do with the ratio available lime to available magnesia estimated as soluble in dilute acid. "Sand-drown" occurs on soils in which total magnesia is high and ratio total magnesia to total lime is greater than 1 (see Bulletin No. 2 of 1925).

Routine laboratory work during the year included :—

Poisons : four stomach contents analysed : one indicated dip poisoning.

Dip : usual supply of deci-normal iodine to C.V.O. Arsenical dip is now manufactured in Zomba for Government tanks at considerable saving.

Milk : two samples analysed.

Limestones : five samples analysed.

Fertilizers : eleven samples analysed. The superiority of ground magnesian limestone has been impressed on planters. Analyses of some limestones are appended herewith.

Water : four samples analysed.

Seed : Disinfection and cleaning of tobacco seed was supervised. Also in extension work, the distribution of good seed was given some attention, some 50 lbs. being dealt with in this way.

Publications during the year were :—

Agronomic Series : Bulletion No. 1, "Tobacco Culture." Comparison of Methods adopted in U.S.A. and Nyasaland.

Leaflet No. 1 : Soil Acidity.

„ No. 2 : Prices of Fertilizers.

„ No. 3 : New Covers for Seed-beds.

Articles have been contributed to *The Nyasaland Times*, *Fertilizer and Feeding Stuffs Journal*, and *Tobacco*.

Several meetings of planter's associations were attended and papers read. While on tour (4,800 miles travelled) advisory work was carried out. Much correspondence was attended to. Samples of tobacco and other products have been collected for expert examination by London buyers and by the Imperial Institute.

ANALYSES OF NYASALAND LIMESTONES.

	ICELAND SPAR AND CALCITES		LIMESTONES		MAGNESIAN LIMESTONES			LATERITIC		TUFA DOLOMITE	
Locality where found	Port Herald	Lake Chilwa	Mpimbi	Balila Cave	Port Herald	Port Herald	Mpemba	Fort Johnston	Kanga-nkunde	Mwanza	Lirangwe
Lime (CaO) ...	54.51	55.36	52.14	49.96	36.42	45.1	35.4	46.95	21.2	27.48	28.12
Carbon dioxide (CO_2) ...	42 59	43.45	40.82	38.92	39.72	39.5	34.7	40.4	12.45	25.45	40.5
Magnesia (MgO)	.05	—	1.18	1.08	10.17	6.85	13.31	3.09	6.56	5.9	20.51
Insoluble matter	.79	.33	.61	.39	2.95	5.26	4.34	1.19	20.38	40.43	2.96
Iron oxide and alumina	.34	.08			3.79	1.83	.64	.44	20.29*		

*Contains 1.1 per cent. phosphoric oxide.
All analyses have been carried out in the Zomba laboratory.

A. J. W. Hornby,
Agricultural Chemist.

Report of the Entomologist

The work of the year under review has necessitated a very considerable absence from headquarters, and the development of the economic collection of insects and identification of specimens has therefore been much held up. The earlier part of the year was largely occupied with the organisation necessary to prohibit the growing of cotton in the North Nyasa district and the regulations preventing the importation of cotton lint or seed into the country. This was followed by some four months spent in the Mlanje district. The African Agricultural Conference held at Nairobi in August necessitated absence from Nyasaland until the beginning of September. As much time as was possible at the conference was spent in obtaining information concerning the coffee crop, and on my return most of the remainder of the year was devoted to a study of this crop.

The questions of allowing tobacco from the Songea area and coffee from the Tukuyu area of Tanganyika Territory to pass in transit through Nyasaland came up for consideration towards the end of the year. The former subject, tobacco, was taken from the point of view of a possible development of a native tobacco industry in that area in the future. The most probable danger that can be foreseen, would be an outbreak of tobacco beetle (*Lasioderma serricorne*, F.), if, for example, large quantities of cured tobacco were to be held up in Nyasaland owing to lack of transport facilities to the port of shipment; and regulations to prevent such an occurrence as far as possible were suggested.

The question of whether restrictions should be made on the transport through Nyasaland of coffee from the Tukuyu area hinged entirely on the possible presence in that area of the Coffee-Berry Borer Beetle (*Stephanoderes hampei*, Ferr.), a serious pest of coffee in Uganda and other countries, but which has not been recorded from Nyasaland. Definite information on this point was not forthcoming, and it was therefore deemed advisable in the interests of the increasing coffee industry of this country to institute rigorous inspections of all consignments received from Tukuyu before allowing them to proceed further than Fort Johnston. If, and when, definite information can be given that the Tukuyu area has been visited by an entomologist and this coffee pest is proved to be absent, I am of the opinion that the restrictions imposed might well be cancelled.

A considerable number of requests for collections of different insects were received from other colonial and foreign entomologists, with which, owing to lack of competent assistance, it has usually been, most regrettably, impossible for me to comply.

With the exception of an address given to the Mlanje Planters' Association in June on the subject of Tea Mosquito Bug and Tea Diseases, and reprinted in *The Nyasaland Times*, no publications were issued this year.

TOBACCO.

The beginning of the 1925-26 season was marked by a serious outbreak of Snowy Cricket, (*Oecanthus pellucens*, Scop.), which devoured the hearts and young leaves of small plants. In some cases four and five insects were found to a single plant, and the small leaves developed with large holes eaten out of them. This insect is generally considered of little importance as a pest, and is usually recorded as being more of a carnivorous than a phytophagus nature. The insect is met with every year but is rarely of exceptional abundance, and the cause of this particular outbreak is obscure. It is probable that climatic conditions, heavy downpours of rain over short periods, brought about an excessive hatching at one time, so that an abnormal number of adults were present when the tobacco offered a most favourable food supply. Dusting with paris green and flour, or lead arsenate, though successful if rain did not fall immediately, was usually rendered valueless by torrential downpours.

A new insect pest of tobacco, though so far of a sporadic nature, is the *Yellow Stem-Grub*, the larva of a weevil (*Dereodus recticollis*, Mshl). The grubs, sometimes three and four to a plant, bore in the stems of small tobacco plants just above and below soil level. The stems rot, the plants break off, and the grubs continue to live in the soil and feed on the remaining root system. They are most usually to be found in the late plantings, being prevalent in small plants in February, the adult weevils emerging in March. The adults are common on the leaves of cotton, groundnuts and sunflowers among other plants, and the possibility of a serious outbreak would appear to depend on the crops grown immediately prior to tobacco. The two most serious cases dealt with up to the present time occurred, in the first place, on tobacco following groundnuts, and in the second case on tobacco following cotton. Over small areas "Vapourite"—a naphthalene compound—was found to destroy the grubs if applied in a small quantity stirred up with the soil near the attacked plants. It is useless to replant until the grubs have been removed. Turkeys readily devour these grubs, as well as innumerable other insects.

Considerable loss was caused during the season by Mosaic Disease, which in some cases appeared in the nurseries.

Outbreaks of Surface Beetles (*Emyon sp. Zophosis agaboides* Cerst, Macropoda reticularis Cerst, and *Psammodes sp.*) particularly the first named, may be expected wherever it has been impossible to keep the fields well cleaned prior to planting. Plants that are beaten down by rain so that the leaves lie flat on the soil attract the beetles, which find shelter under these leaves and gradually work their way towards the stem, which they devour.

At the beginning of the 1926-27 season a case occurred where these beetles appeared in such numbers that hand-collection failed to cope with them. A paris green poison bait was used successfully, distributed near the plants and in heaps of weeds left in the fields. Hand-picking was employed in addition as the beetles congregated in the vicinity of the bait, facilitating their collection. The real control is, however, the proper cleanliness of the fields

prior to planting. It is frequently stated that poison bait is not effective against these pests, as few dead beetles are to be found. The reason is that the dead beetles are rapidly removed by ants and other insects. In the case in question large quantities of the remains of all the above species were found round the nests of a Myrmecine ant, which, however, was not observed to capture living beetles.

Eelworm.—Root Gallworm (*Heterodera radicicola*, Greef) continues to be the most pressing problem with which tobacco planters have to contend. The subject is one of the utmost difficulty, and with the increase in the native tobacco industry there is here a field of work which could well employ the whole time of a single investigator. In fact, this is, in my opinion, the only way in which the problem can be satisfactorily tackled. It is estimated that 25 per cent. of the correspondence and enquiries dealt with by this division during the tobacco season are connected with this subject. Owing to the delayed arrival of apparatus from England, the experiments devised for testing the value of different methods of burning seedbeds and the change in temperature which the seedbed soil undergoes during the season could not be carried out this year.

A sample of calcium cyanide (Cyanogas) from America was at last received after being eight months *en route*, and is being tested as to its efficacy in clearing eelworm from seedbeds under field conditions. One case of eelworm attacking velvet beans (type unknown) was reported. In this connection it is interesting to note that it has been shown (Steiner: "Phytopathology," XV, No. 9, September, 1925: R.A.E. Vol. VIII, 1925, p. 618) that a given strain of eelworm, if forced by starvation, will attack a plant that it would completely ignore if a more preferred food plant were present. This tends to show that the "starvation" method of eradicating eelworm, as stated at the Agricultural Conference in Blantyre, is very intricate, requiring two or three years of *different* immune crops.

One native tobacco grower applied for poison with which to combat cutworm in his seedbeds. The request was refused, but such other assistance as was possible was given. The question of natives handling poisons for the control of tobacco pests in their gardens will, I assume, be considered by the Native Tobacco Board.

COTTON.

This crop continues to be dealt with, almost entirely, by the staff of the Empire Cotton Growing Corporation. Confirmation of the identification of the Pink Bollworm (*Platyedra gossypiella*, Saunders), found in the North Nyasa district, was received in September from the Imperial Bureau of Entomology, who, however, retained the specimens. The Cotton Leaf Roller (*Sylepta derogata*, F.) and the Black Leaf-beetle (*Syagrus morio*, Har.) were reported as doing considerable damage in the Chiromo district.

TEA.

In Nyasaland this crop is exceptionally free, at present, from insect pests. The devastating insects of the larger tea districts of the world, such as Shothole Borer and Tea Tortrix, are as yet unknown here. Nevertheless, there are many indigenous insects that may well become as important to the tea industry in this country as those known to tea cultivation elsewhere, so that undue complacency about Nyasaland's present freedom is to be deprecated. The tea industry in Nyasaland must realize the value of profiting by the many years experience of other tea countries and so avoid the accumulation of troubles that may occur in years to come. With a perennial crop such as tea, season after season may pass without any cause for anxiety and then a few seasons may see the development of some disease or pest to such an extent that the industry is severely checked for a considerable period. Such a position is particularly possible in Nyasaland where the area suitable for tea cultivation is limited. An example of this sort of danger lies in the presence of "Botryodiplodia" root disease, which has now been shewn to be a prevalent tea disease in this country. There is much to be gained from Ceylon experience of this disease. Of recent recognition in Ceylon, it has been proved in that country that the disease is most marked where prunings have been systematically buried over a long succession of years. If the tea industry in Nyasaland is to continue successfully, those concerned with the crop must face the fact that the continuous burying of prunings is to be avoided if the health of the tea gardens is to be maintained. Machines and materials for dealing immediately with diseases and pests should be a recognised portion of the essential equipment of every tea estate.

On the whole, tea planters are now paying more attention to the control of diseases than in past years. There is no doubt that the annual pruning practised in this country serves to keep in check many leaf and stem diseases and insect pests, but root diseases are in a different category and must be dealt with through a definite campaign.

Tea Pests.

Of the insects attacking tea, Mosquito Bug and Red Spider are of chief importance, and should be recognised as requiring definite control measures being taken against them each year. There has lately been some trouble with Termites attacking young tea plants, and this subject is receiving close attention.

Several other insects are to be found damaging tea bushes, but usually in a very minor degree and do not call for special control. The bugs, *Riptortus longipes*, Dall., *R. dentipes*, F., and *Anaplocnemis curvipes*, F., all suck young tea shoots, producing withered tips. On the other hand a somewhat similar bug *Mirperus albidens*, Westw., though equally as prevalent as the above, was not seen to feed on the bushes. A number of grasshoppers feed on the older leaves. *Catantops melanostictus*, Schaum., is most common, together with a large species of *Acanthacris*, but the damage done by them is generally negligible, and the former species is largely preyed upon by several species of Asilidæ (Robber Flies). The grub of an undetermined Agromyzid fly mines in the leaves, and the caterpillar of a small Limacodid moth was found devouring the young foliage on a few occasions.

1. *Tea Mosquito Bug* (*Helopeltis bergrothis* Reut.).—The life history of this Capsid was followed through in detail from March to June, and through the courtesy of the Blantyre and East Africa Co., Ltd., hand-collection of the bugs over a definite area was carried on during the whole year. This mosquito bug is larger than that known in India, and is red and black in colour. The bug is indigenous to Central and West Africa, and feeds on a variety of crops, including cotton and native gourds. The possibility of this insect becoming a serious pest of tea must not be overlooked. The annual pruning practised in Nyasaland undoubtedly serves to check the continued increase of mosquito bug from season to season, but the damage done by the bug each season is, of course, accomplished before pruning takes place. And the presence of unpruned plants in nurseries provides a food supply for the insects when the older bushes are lacking foliage.

It seems probable that climatic conditions influence the relationship between the attack of the bugs and the amount of damage suffered by the tea plants. The season 1925-26, though not characterized by excessive rainfall, was marked by lack of sunshine during the rains, and the attack of mosquito bug was certainly greater this year than in the past. The vagaries of mosquito bug attack are difficult to explain: during the period under review the tea most seriously attacked consisted mainly of the young plants in new extensions and the nurseries. Although it was not an invariable rule, on the whole the Indian jat appeared to suffer more than the local. Patches of attack were noticeable in some established gardens, and in one case where the reduction in flush due to the damage done by the bug was quite appreciable, it was very evident that the soil conditions were not as favourable to healthy plant growth as they might have been. It is hoped to publish a full account of this pest in the near future. The very interesting fact that has so far materialized is that the mosquito bug appears to reach its maximum numbers in February or March, whereas the tea flush attains its greatest yield during the previous two months, the actual periods varying from season to season. Thus, speaking in wide terms, it seems that normally the main tea flush will escape the maximum mosquito bug attack. Nevertheless, the latitude is not great, and the damage that could be done by the pest, as a result of any conditions bringing the two foci closer together, would be enormous.

It has been shewn that the mosquito bug commences to increase rapidly in numbers soon after the rains commence. Collections made, under as nearly as possible identical conditions, from May to December, gave a steady fall in numbers, from 4,000 bugs caught in May (17 days collecting only) to only five caught in November, in which month no bugs at all were caught for the first twenty-seven days. In December the numbers caught each day rapidly increased during the month, and the total was approximately 300, of which only 1 per cent. were adult. A rather similar record was obtained in October, but in the reverse manner. The total captured in this month was 476, of which 50 per cent. were adult. But the last ten days of the month produced only 32 insects, and the last three days were totally blank. There is thus a period during which mosquito bug is practically absent; during the season under review it extended from approximately October 21st to December 8th (seven weeks), and this period appears to some extent to be correlated with the rainfall.

The number of bugs decreased during the latter part of October, in which month there was no rain after the seventh day. Two heavy downfalls in November had no effect, but as the rains became more general in December so did the bugs rapidly increase in numbers. It is obvious, therefore, that hand-collecting should be concentrated on as soon as the rains commence. Situations, such as nurseries and new extensions, which have carried foliage the whole year, are the starting points for mosquito bug.

As the nymphs of mosquito bug have a habit of hiding themselves in the interior of the bushes during the hotter part of the day, the value of dividing the collection of them into morning and afternoon spells was tested. The results showed no great difference from those obtained by continuous collecting, partly because of the dislike of labour for such an arrangement. The fact that having collected 4,001 insects off a small area in one month, 3,212 more were collected off the same area in the next month, shows the tremendous numbers these bugs will reach under favourable conditions if left unchecked

2. *Red Spider* (*Tetranychus bioculatus*, W. M.).—This pest makes its appearance every season in certain areas. The season 1925-26 was notable for a more extensive attack of red spider than is normal, and it was found in some places as unusually late as the month of May. On the other hand, the early rains of the 1926-27 season were extremely scanty, the season commencing with the heavy rains, with the result that red spider was little in evidence and has been practically negligible.

In the majority of cases where red spider appears each year, the soil conditions need improving. In one area where red spider did considerable damage every season, the planting of trees (Grevilleas mainly) and increased drainage has in four years rendered that area comparatively free from attack. Applications of lime sulphur as a spray or dust should be made to gardens likely to suffer from red spider attack as soon as the new foliage appears after pruning, before the pest has made itself evident.

3. *Tea Leaf Weevil* (*Dicasticus*, sp. nov.).—A potential pest of young tea is a large brown weevil, recorded by the Imperial Bureau of Entomology as a new species. The adults eat the leaves and the female lays eggs under the folded back tip of a leaf or between two leaves which are glued together. Oviposition was noted as taking place in April, and in captivity one female laid ten batches—a total of 480 eggs—in this manner in a period of three weeks. The eggs hatch in seven to ten days and the grubs fall to the ground, where they burrow in the soil. It was not possible to take the life history beyond this point owing to pressure of other work, but if the grubs develop a taste for the roots of tea plants the effect might be serious in the case of young tea.

4. *Termites.*—A species of Scavenging Termite (sent to South Africa for determination) was found at Mlanje and reported from Zoa towards the latter part of the year to be attacking young tea. In the first case the tea had been cut down following an attack of "Macrophoma" die-back

disease. The termites had entered the wood of the main stem and branches and had, in some cases, completely hollowed them out. It is probable that the bushes were rendered liable to attack by the fungus disease; in addition, the area affected seemed to require further drainage, which would render the soil conditions less favourable to the termites. At Zoa, on the other hand, the plants had not been cut back; and in this case, as far as information was available, it appeared that a heavy cover crop was dug in rather late in the year, and probably such attracted the Scavenging Termites, which later turned their attention to the less healthy tea plants. Various methods of using poisons were suggested, paris green and chopped grass placed near the plants being most successful. Repeated disturbance of the surface soil near the plants seemed effective in deterring the insects from making further progress. The planting of euphorbia cuttings near attacked plants to drive away the termites—a native superstition—proved useless.

Leaf Diseases.

Many of the more common leaf diseases have been found, and these fungi are mainly of the same types as are known elsewhere. Such diseases will manifest themselves every year, but generally speaking they are unlikely to do a great deal of damage. Tea most likely to suffer will be the young plants in new extensions, having a small area of foliage. In establishing new gardens, particularly if an unacclimatized jat of tea is being used, the application of Bordeaux Mixture should be possible at any time, without delay in obtaining materials or apparatus.

1. *Brown Blight* (*Colletotrichum*) *and Grey Blight* (*Pestalozzia*) are most prevalent. As a rule, little damage is done by these fungi to the older bushes, but new extensions, particularly of Indian jat, have suffered to some extent. In some cases this was doubtless due to the employment of a very heavy cover crop on these extensions, making the conditions favourable to the development of the fungi. On the removal of this cover crop, in due course, the diseases did not increase.

2. *Fungi* similar to Copper Blight (*Guignardia*) Marginal Corrosion (*Colletotrichum* and *Pestalozzia* together) and Rim Blight (*Cladosporium*), as well as types comparable to *Mycosphærella* and *Cercosporella* were also found to be present. But none of these appears to be of importance.

3. A very common fungus of the *Phoma* type was found. In appearance the spots caused by this fungus are very similar to those caused by mosquito bug in their later stages, and the fungus has been found intermingled with these spots. It may be responsible for some initial damage, but it has not as yet been found producing such large diseased areas on a leaf as recorded from Ceylon. It is probable that the damage done by mosquito bug is frequently carried to a conclusion by this fungus.

4. *Scabbed Leaves.*—Typical seabbed leaves are moderately common among the older leaves of both full grown and young bushes. The development of the spots on any one leaf is slow, and no particular effect on the bush takes place.

The following diseased appearances were noticed, but it has not been possible to trace their origin or cause.

5. *Scaly Upper Surface to Midribs.*—This is a brown appearance, marked transversely, on the midribs of the leaves. It appears on leaves of all ages and would seem to be present in the midribs before the leaf unrolls from the bud. It does not seem to spread to the lamina of the leaf, and no organism has been found. One or two of the older bushes had practically every leaf of the later growth marked in this manner, but the bushes and the leaves themselves appeared to be perfectly healthy otherwise.

6. *Copper-coloured Sheen between the Veins.*—A few of the older leaves were marked with large, irregular-shaped blotches in this manner. It appears to be of a physiological character. No increase in size of these areas was noticed over a period of three weeks, and otherwise the leaves appeared to be perfectly normal.

7. *Blister-like Swellings.*—The convex surface of the blister is on the upper surface of the leaf, and is of a pale green colour. The concave under-side becomes brown and scaly. Later, the centre of the blister cracks, leaving an irregular perforation of the leaf at this point. Various fungi were found in conjunction with these spots, such as *Colletotrichum* and *Mycosphærella*, and on one occasion a *Cercospora*, but the real cause is doubtful. It may be a combination of mosquito bug attack and fungi. There is a considerable amount of this phenomenon to be found, and it is usually most prevalent where mosquito bug damage is also present. These blisters, however, differ from normal mosquito bug damage in that they do not destroy the whole leaf, and their development is slow.

Stem Diseases.

8. *Die-back* (*Macrophoma theæ*, Speschnew).—This is by far the most important fungoid disease, other than root diseases, which attacks tea in this country. It causes "die-back" of the shoots of the older bushes and has seriously attacked young plants and seedlings in the nurseries. It was first seen at the beginning of the year on the older bushes and later on extensions of young tea of both Indian and local jat. In July it was found that a large number of nurseries were suffering severely from this fungus, and there were indications that the unacclimatized Indian jat was more susceptible than the local tea.

Drastic action was necessary. The affected tea, both young plants and nurseries, were pruned down and several applications of Bordeaux Mixture given. The disease appeared to be checked and in most cases the plants made new, healthy growth. Where the plants failed to recover it is probable that the disease had penetrated too far down the stems before action could be taken. The severity of this disease in the nurseries inclines one to the belief that the climatic conditions of 1926 were not alone responsible: nursery sites are limited by accessibility of water supplies among other factors, but I am of the opinion that more attention to the soil conditions of the nurseries and the opening up of the vegetation surrounding the nurseries so as to allow a freer circulation of air through the plants—as in many cases they are unduly

sheltered—would give beneficial results. Later in the year this fungus, together with what appeared to be its higher form, *Desmotascus*, was found on tea and Grevillea trees in conjunction with a species of *Septoria* and several other fungi.

The die-back of shoots, after the first growth of new foliage, on bushes which have been pruned seems to be due to *Macrophoma*, but in these cases there is also the probability of *Botryodiplodia* root disease being implicated.

9. *Nectria and Stilbum.*—These fungi are found continually on dead and dying shoots and bushes. How far they are responsible for the direct death of tea plants it is difficult to say, but it seems most likely that they are mainly saprophytic. *Stilbum* is extremely common, particularly on bushes attacked by root diseases. This fungus is frequently mistaken for red rust, but up to the present time the parasitic form of red rust has not yet been found, though the superficial form on the leaves is common.

Root Diseases.

10. *Stump Rots.*—A few cases of *Armillaria* destroying the older bushes have been noticed, and the ordinary treatment of removing tree stumps and applying lime was employed. Some young Indian plants succumbed to what appeared to be "Brown Root Disease." It seems to be fully recognised that the removal of all tree stumps is essential if these root diseases are to be avoided. *Roselinia* fungus has not yet been definitely recorded from any tea area.

11. *Botryodiplodia Root Disease.*—This fungus appears to be by far the most important and difficult trouble with which tea planters in Nyasaland have to contend. Of a large collection of diseased tea plants made in the Mlanje and other districts in December, 66 per cent. were found to be attacked by this disease. These plants were of all ages ranging from full-grown bushes to plants one year old; and one nursery seedling was also found to be attacked. Of seventeen plants taken from areas planted in 1925 and 1926, both Indian and local jat, every plant had been killed by *Botryodiplodia*. The form of attack by this disease is exactly as described in Ceylon, and it seems essential that the measures recommended for its control in that country will have to be adopted here. The question of disposing of prunings in some other way than by burying will have to be faced, whatever the difficulty may be. A continuous campaign against this disease will have to be considered a regular part of tea cultivation in Nyasaland. In attempting to establish tea gardens of Indian jat, it seems essential that the prunings should be burnt for the first two or three years; and in all probability this will now be necessary in new extensions of any acclimatized jat.

The dying back of shoots making new growth after pruning, referred to above as being attacked by *Macrophoma*, are most manifest on bushes showing signs of becoming affected with *Botryodiplodia*. Owing to the slow development of this latter disease it is difficult to prove the relationship in the earlier stages of the fungus. It seems probable, however, that the shoots so affected are weakened in the first place by the action of *Botryodiplodia* on a portion of the root system, and the *Macrophoma* fungus is thus enabled to complete its destruction. The remedy, therefore, necessitates the application of lime to such bushes in addition to cutting out the dead shoots, making the cut three to four inches into the green, healthy wood.

COFFEE.

A great increase in coffee cultivation has taken place in the last year or two, and many planters have adopted coffee as a subsidiary crop. It is unfortunate that it has not been possible to keep the gathering of information on pests and diseases of coffee ahead of the rapid expansion of coffee growing. Although scarcely coming within the scope of this report, it may be as well to point out that all parts of Nyasaland are not equally favourable to successful coffee cultivation, and the main barrier to success with coffee in this country is the long, dry spell experienced each year, after the cropping period. In producing their fruit the coffee bushes expend a very large proportion of their vigour, and the resulting lack of vitality in the bushes coincides with the time of year most unfavourable to the plant and most favourable to certain insect pests.

It must be realized that coffee requires as much attention as any other crop, and neglect of normal cultivation methods will inevitably lead to disaster. Every endeavour should be made to assist the plants over the dry weather period, after they have borne fruit, by irrigation, by manuring, by the use of shade trees or by conserving soil moisture with continual mulching. Irrigation is, of course, the ideal method. Artificial manures are being tested in the 1927 season. The vexed question of shade trees must be considered on the individual merits of each particular case: several kinds of trees are being experimented with on different estates. The following local trees are well known to be harmful and should be avoided: Charcoal Tree ("mpevu"), Persian Lilac (*Melia sp.*) and the "Mjomba" or "Lusi" tree (*Brachystegia sp.*). Continual mulching in the dry weather is essential, and too close planting should be avoided.

Coffee Pests.

Coffee suffers from a large variety of pests, but being a very hardy plant can withstand a great deal of persecution, *provided it is in a strong, healthy condition.* Insects are attacking coffee practically all the year round, and continual attention is necessary to keep them in check. Immediately prior to the rains, two species of grasshopper are abundant in coffee gardens, "topping" the plants and devouring the young shoots. The large green grasshopper—*Aularches sp.*?—is to be found during the day. The brown, wingless grasshopper (*Enyaliopsis petersi*, Schaum.) works at night and hides during the day time. A favourite resting place of this insect is in the apex of the conical grass shades placed over the smaller plants. Both these grasshoppers can be hand-collected, and this should be made a regular practice. In one case the eggs of *Enyaliopsis* where found in a bore made by the Black Borer Beetle (*Apate sp.*) in a coffee stem. The eggs of *Aularches* are laid in packets in the soil and cultivation tends to destroy these packets.

Cutworms (*Euxoa segetum*, Schiff.) develop with the rains, and young plants can be protected by shields or collars round the stem at ground level. Shields made from banana stems have been successfully employed, and metal shields have been ordered from Kenya Colony for trial.

There are several leaf-eating caterpillars that attack coffee, but these are not as a rule serious. A slug-like caterpillar of a vivid green-coloured moth (*Parasa vivida*, Wlk.) is most common, but can easily be hand-collected, being of a gregarious nature. It also feeds on cotton and castor leaves, and this latter plant should be watched carefully if used as a temporary shade for young coffee.

A leaf-mining caterpillar, probably *Leucoptera sp.*, making brown-coloured blotches on the leaves, is very common, and its work is particularly obvious in the dry weather.

The most serious coffee pests are the Cameron Bug, the Stem-borer and Thrips.

1. *Cameron Bug*, (*Antestia variegata*, Thunb.).—It has not been possible to carry out any further work on cameron bug. The abundance of this insect from season to season and the damage done by it is very varied and irregular. Generally, the eggs are highly parasitized. If necessary, spraying with sweetened arsenite of soda, for which complete success is claimed in Kenya and Tanganyika Territory, may be employed. The spray is made up as follows:—

Sodium arsenite	...	...	...	¾ ozs.
Sugar or Jaggery	...	...	...	2½ lbs.
Water	...	...	...	4 gallons.

This is applied in the form of a fine mist, which is allowed to fall lightly on the outside of the bushes, the spray nozzle being directed upward and the operator walking at a steady pace between the rows. Applied at this strength and in this manner scorching is negligible. Experience in other countries shows that cameron bug appears to be more numerous on coffee grown under shade but seems to do less damage.

2. *The White Stem-Borer* (*Anthores leuconotus*, Pasc.).—This beetle is undoubtedly responsible for more damage to coffee than any other insect. The adult beetles appear with the rains and eat the young shoots. Hand-collecting at this time should be considered absolutely essential and neglect of such work will not only be detrimental to any one coffee garden but is liable to be a serious danger to neighbouring estates. Eggs are laid soon after the beetles appear on the bark of the stem above ground level. On hatching, the legless, white grub gradually works its way down to the roots, burrowing just under the bark, leaving no trace of its presence unless the bark be broken away by hand, when the burrow will be seen encircling the stem and winding downwards.

On reaching the roots the grub continues burrowing, sometimes completely entering a root, and finally it tunnels upwards into the main stem, usually at a point just below the collar. Frequently this entry is made at the junction of a root and the main stem. The tunnel is then continued upwards and a very large cavity is made, the site of which is indicated by an extrusion of wood frass. In this cell the grub pupates and the adult beetle hatches out with the next rains. The period occupied by the grub is at least two years and perhaps longer in some cases. The plants do not show any effect until the dry weather, when those attacked by stem-borer can easily be detected by the withering, yellowing and dropping of the leaves. But by the time this affect is noticeable the grub has usually reached the stage when it is about to pupate—having been in the bush for some two years—and the damage is done. Two and three-year-old coffee bushes that look perfectly healthy for the next two years may gradually in the dry weather of the fourth or fifth year develop these symptoms and prove to have been attacked by stem-borer. Hence the great importance of collecting the adults on their first appearance at the beginning of the rains.

The practice generally adopted in the dry weather has been to uncover the roots of those plants showing the symptoms of stem-borer attack and cut out the grub or kill it *in situ* with a piece of wire. Although the coffee plant will stand a considerable amount of cutting in this manner, it frequently happens that the grub is very difficult to uncover without severe damage being done to the bush. A very satisfactory control, however, has been found in Paradichlorbenzene, which eliminates all cutting of the stem. The plug of frass extruding from the cavity is removed as far as possible and a few crystals of Paradichlorbenzene are pushed up into the cavity. The hole is then covered with mud or clay, and the soil replaced over the roots. Grubs treated in this manner were found to be in a moribund condition in six days, and complete disintegration had set in within three weeks. The bushes showed no harmful effects. This method is more simple than the use of carbon bisulphide.

Further work is being conducted on the possibility of catching the grubs before they have got down below soil level. It is obvious that much damage would be saved if this were possible, as the small tunnel made by the young grubs just under the bark is not as detrimental to the bushes as is the damage done later to the root system. The young grubs are probably present in this position during January or February, but the time will vary according to the season. As there is no external sign of the grub's presence at first, it will only be by "handling" the stems so that the tunnel is broken open that the grub will be discovered. Although coffee of all ages will be attacked by stem-borer, plants about two or three years old seem most likely to suffer. To prevent the adults from egg-laying and with the possibility of killing the young grubs soon after hatching, preliminary trials have been made with various deterrent and poisonous paints to test the effect of such on the plants. It seems unlikely that a deterrent paint will be successful as it must withstand torrential rainfall, but a proprietary form of a tanglefoot grease shows some promise. Lead arsenate, sodium fluoride and zinc sulphate were all used, with and without a resin-washing soda adhesive, and also in conjunction with Paradichlorbenzene. The latter substance, however, evaporated too quickly to be of any real value on being melted so as it could be incorporated in the poison. Zinc sulphate appeared least resistant to weather conditions. Two months after application, during which time fourteen inches of rain fell in one month, the lead arsenate and sodium fluoride pastes were still present to some extent, more particularly where the adhesive had been used. The two-year-old plants treated showed no adverse affects after this period, and the subject is being pursued.

The control of coffee stem-borer should, at present, be carried out in three definite phases: (1) Catching the adult beetles when the rains break; (2) Catching the young grubs on the stems before they have got below soil level by "handling" the stems a few weeks after the adults have appeared; (3) Killing the grubs in the roots with Paradichlorbenzene.

3. *The Black Stem-Borer (Apate sp.)*—This is a different type of beetle to the last named, varying in length from half to one inch, and of a jet black colour. It is the same beetle as is found boring in poles, baskets, etc. Its attacks on coffee appear to be of a sporadic nature only. The attack is quite different from that described for the white stem-borer. The beetle itself bores right into the stem, usually about the centre of the bush but sometimes close to the ground, which is covered with the sawdust-like frass that is extruded from the burrows. It works at night and very rapidly. Two beetles found commencing their burrows at 9 p.m. had completely disappeared inside the stem in half an hour, and during the night they each constructed a tunnel which completely hollowed out the stem for a distance of six inches or more. One bush was found to contain six burrows, varying in length from two to eight inches, and the commencement of a seventh. No eggs were laid and no grubs were found: the life history is not known. Crystals of Paradichlorbenzene inserted in the bores, which were then plugged with clay, killed the beetles in from 12 to 24 hours, according to the length of the burrows. The crystals had not disintegrated after three days. This beetle may be expected to appear immediately prior to the rains.

4. *The grub of a beetle* (probably *Dirphya sp.*) has been reported as boring in the shoots of coffee bushes, but has not been studied. This grub commences boring down the smaller shoots towards the main stem. If necessary, it can be controlled by pruning off the attacked shoots, or using Paradichlorbenzene.

5. *Thrips (species not yet determined).*—This pest may be expected to appear every dry season before the rains break. If early rains are scant and the main rains delayed, thrips will become more and more serious as the dry weather continues. The attack of thrips is to suck the juices from the epidermal cells of the leaves and green shoots, and under suitable conditions their increase in numbers is so rapid that a few days may see entire gardens turn from normal green to a silver-grey colour, which is characteristic of thrips attack. The result of the damage done by thrips is far reaching. At the time when thrips may be expected the coffee bushes are in a weakened condition following on the production of their crop, the dry weather is adversely affecting them and they have no vitality with which to withstand or overcome the damage done by the pest. Consequently, when the rains break and the pest disappears, the condition known as "Die-back" sets in. The leaves fall off, the flowers do not set, the shoots turn black and die off down to the main stem, and no crop is formed. The centre of the bush suffers most. There would seem to be little doubt that gardens situated so as to receive the maximum quantity of sun suffer more from thrips than do those that receive some protection during part of the day. During the season under review there was a very serious outbreak of thrips in one district which received no rain between April 1st and November 14th. Spraying was commenced early, but owing to lack of sufficient materials and machines the pest rapidly got ahead of the control, ideal conditions for its increase prevailing over three months. The ordinary sprays, such as Tobacco Extract and Paraffin Emulsion, were successful where application was made early enough. Although the pest became too firmly established for spraying to eradicate it, it was shown that a solution of the green leaf of the local fish-poison plant, *Tephrozia vogellii* ("Ombwe," "Njerenjere," "Mtutu"), was a very efficient contact insecticide for such an insect. The green leaf was used at the rate of 1 lb. to 12 gallons of water, being crushed, soaked in a little water, squeezed and strained through sacking, and the liquor made up to the desired quantity. It was found necessary to add a spreader, as although the solution by itself killed the thrips it did not cover enough of the leaf surface when applied as a spray. Soap was the only material that could be obtained, and although this has killing powers in itself it was possible to reduce the quantity of soap to a minimum, only 4 ozs. of soap being used to 12 gallons of Tephrozia solution: the cost of this spray was approximately 10d. for 24 gallons as against 7s. for the same quantity of paraffin emulsion.

It is essential that coffee planters should be in a position to combat thrips immediately the pest commences to develop: a careful watch during August and September should be kept for the first signs of the pest, and immediate action taken. No pruning should be practised after a heavy infestation of thrips until the bushes have completely recovered. Shade is reported to lessen the virulence of attack by thrips.

Coffee Diseases.

A little work has been done on coffee diseases. A *Fusarium* Wilt attacked seedlings in a nursery that had been over-watered, but applications of Bordeaux Mixture checked the spread of this disease. Young plants that had been somewhat neglected and were dying back were found to be infested with a *Phoma*, apparently similar to that found on tea, a *Pestalozzia*, which appeared to be different to the grey blight of tea, and a *Fusarium*. *Armillaria* root disease has been found on coffee.

The physiological condition known as "die-back" is undoubtedly a serious proposition in this country, and owing to the long period of dry weather experienced here each season it will have to be contended with every year. Any and every action that can be taken to assist the coffee plants to withstand this period will be necessary to avoid such serious die-back that no crop is produced. Die-back follows on the exhaustion of the bush, which may be due to over-bearing, over-pruning at the wrong time of year, thrips and other insect attacks, low rainfall, faulty planting and many other causes. Heavy applications of kraal manure are recommended in Kenya when die-back is prevalent, but probably in Nyasaland the addition of some artificial manure will be desirable in order to keep heart in the bushes during the prolonged dry weather, and thus avoid the reduced vitality which allows the many factors connected with die-back to exert their full influence.

MAIZE.

The Maize Stalk Borer *(Busseola fusca*, Hmps.*)* is responsible for more damage than probably is realized. Moths have been reared from maize and millet stalks of a growing crop and from old stalks left lying from the previous season over a period of six months, from January to June, and healthy larvæ have been found in old stalks left in the ground in September. Some parasites have been reared, but parasitism is not high. If maize is to become a cash crop on any large scale, the removal and destruction of old stalks and thorough cultivation of the fields immediately after the crop is harvested will be essential.

FORESTRY PESTS AND DISEASES.

A Pyralid caterpillar borer (*Terastia sp.*) did considerable damage to young Dadaps (*Erythrina)* planted in nurseries with a view to being utilized as shade trees in tea gardens. So severe was the damage that practically every Dadap tree succumbed,

A serious outbreak of Waxy Scale (*Ceroplastes sp.*) on *Cedrela toona* in the Forestry Department's gardens near Zomba was reported late in the year, but no good remedy could be devised.

Armillaria root disease was found to be doing considerable damage to the plantations on Zomba Mountain. A system of barrier trenching was adopted, which should check further spread of this disease. A case of this disease having attacked and killed a plum tree was received from Limbe.

MISCELLANEOUS.

An outbreak of Cockchafers (*Melolonthidæ*, sp. undet.) attacking the roots of rose bushes was reported from one estate early in the year. Concentration on hand-collecting was the remedy employed, and it is probable that the beetles, which had burrowed to the roots for the purposes of oviposition, were removed in time to prevent this occuring.

The larvæ of a common large, red weevil (*Alcides erythropterus*, Chev.) were found making large galls in the stems of "Kalongonda" beans (velvet beans). The adults emerged in October and November.

It was found that for a *temporary* measure against white ants in house walls and floors, an application of carbon bisulphide, followed by Paradichlorbenzene forced into the runways and between the bricks, was more effective than the use of the white ant fumigator with arsenic and sulphur, which is best employed in dealing with nests in the open. The effect of this treatment lasted successfully for three months before the white ants returned.

CONCLUSION.

It is generally considered that the number of crops grown in Nyasaland could well be augmented. From a commercial standpoint this is probably desirable, but from an entomological point of view, unless competent assistance is to be available, the possibility of new crops requiring attention is almost a matter for dread. It is becoming increasingly difficult to cope with the numerous problems concerning the crops already in existence and the multitudinous other subjects that are dealt with by the Entomological Division. The development of the native tobacco industry opens up problems that will have to be considered from an entirely different basis to that for European cultivation, and the enlargement of the tea and coffee industries has been more rapid than was possible for the collection of data concerning the pests and diseases of these crops. The position of Nyasaland frequently renders impossible the use of well known effective remedies, owing to the high cost of the materials when landed in the country, and the development of suitable local materials requires whole-time attention. Setting aside all mycological work, the entomological problems of the three crops—tobacco, tea and coffee—alone are more numerous than can be successfully dealt with under present conditions.

COLIN SMEE,
Entomologist.

EUROPEAN AGRICULTURE, 1926.

Name of District.	Total Acreage under cultivation. Acres.	Cotton. (Lint) Acres under crop.	Cotton. (Lint) Yield cwts.	Tobacco. Acres under crop.	Tobacco. Yield cwts.	Maize. Acres under crop.	Maize. Yield cwts.	Tea. Acres under crop.	Tea. Yield cwts.	Coffee. Acres under crop.	Coffee. Yield cwts.	Rubber. Ceara. Acres under crop.	Rubber. Ceara. Yield lbs.	Rubber. Para. Acres under crop.	Rubber. Para. Yield lbs.	Chillies. Acres under crop.	Chillies. Yield cwts.
Lower Shire	7,616	2,600	877	47	192	318	2,473	...	...	..	...	...	...	...	...	9	15
Chikwawa	7,340	5,384	1,879	73	205	751	2,022				...			.	...	..	..
Central Shire	845	..	...	541	1,914	75	390	25	...	70	...	...	...	45	896	...	...
Cholo	14,140	578	372	6,450	16,240	524	4,122	597	1,120	83	28	...	...	...	...	...	...
Mlanje	9,088	308	89	2,230	5,140	331	2,535	5,163	10,224	82	67	...	...	...	...	...	...
Blantyre	6,544	..	..	3,810	7,867	545	3,717	3	...	489	269	...	...	50	..	..	.
Chiradzulu	4,646	530	105	1,884	4,734	135	1,135	...	...	...	..	...	...	...	...	...	.
Zomba	8,004	2,002	759	3,972	9,871	474	4,961	...	..	127	80	..	...	...	...	5	12
Upper Shire	459	310	43	114	245	30	360	..	...	...	...	..	...	.	...	...	..
South Nyasa	1,701	...	..	1,436	4,031	42	520	...	..	18	...	...	...	...	...	...	...
Ncheu	2,463	66	13	1,448	4,228	413	3,128	...	...	432	467	...	...	20	896	...	...
Dedza	1,233	680	152	426	968	5	60	..	..	22						.	...
Fort Manning	32	..	...	2	5	...			.				.		.	...	...
Lilongwe	483	...	...	402	1,515	20	340	..	...	...	...	...	...	...	...	...	...
Dowa	951	900	304	..	...	6	55					...		..	.	..	..
Kota Kota	11			..											..	...	...
Kasungu	2	...	...	...	..	1	3	...	...	...	...	..	...	..	..	...	.
Mombera	...	...	...	...	..	...		...	..		...				..	..	...
West Nyasa	1,250	...	...	...	..	...	...	...	...	...	...	...	...	1,250	169,831	.	...
North Nyasa	357	...	...	73	404	188	2,370	...	..	...	...	...	..	...	...	...	...
Total	67,165	13,358	4,593	22,908	57,559	3,858	28,191	5,788	11,344	1,323	911	...	...	1,365	171,623	14	27

Name of District.	Capsicums.		Fibres.		Beans.		Groundnuts.		Wheat.		Miscellaneous.		Timber and Firewood		English Potatoes.		Millets.	
	Acres under crop.	Yield cwts.	Acres under crop.	Yield cwts.	Acres under crop.	Yield cwts.	Acres under crop.	Yield cwts.	Acres under crop.	Yield cwts.	Acres under crop.	Yield cwts	Eucalyptus acres.	Others acres.	Acres under crop.	Yield cwts.	Acres under crop.	Yield cwts.
Lower Shire	...	..	4,625	7,812	16	120	...	...	.	...	1	6	...	...	...	...	...	..
Chikwawa	...	...	...	...	5	20	10	18	..	...	...	...	1	36	..	...	1,080	2,576
Central Shire	...	...	...	...	..	...	...	...	...	...	...	...	65	24		...		.
Cholo	...	...	...	...	1,587	2,882	1,246	2,868	17	40	4	10	126	677	2,569	359	.	..	...	...
Mlanje	...	...	...	..	.	...	146	751	10	40	...	...	...	..	363	450	..		..	
Blantyre	...	...	...	...	...	...	98	145	4	8	..	...	4	41	1,390	151		..	...	...
Chiradzulu	...	...	...	...	...	...	152	492	.	...	..	...	31	67	1,565	349		.	..	..
Zomba	...	...	..	...	...	...	319	825	10	24	..	..	41	244	616	438	..	...	..	...
Upper Shire	...	...	...	...	...	...	..	...	4	43	...	...	...	...	..	1		..		...
South Nyasa	...	..	.	..	..		16	34							38	151		..		...
Ncheu	...	...	...	...	...	..	63	163	...	...	...	...	...	..	6	15	.	..		..
Dedza	...	...	...	...	...	...	2	9	...	...	1	10	...	...	65	22	10	400	.	..
Fort Manning	...	...	...	..	...	...	6	21	...	...	17	31	...	...	1	6		.		...
Lilongwe	...	...	...	...	..	...	2	3	...	...	...	...	...	...	...	59				.
Dowa	...	...	...	...	...	...	2	11	...	...	8	74	5	40	...	30	...			.
Kota Kota	...	...	..	...	...	..	...	...	...	...	1	1	...		10					..
Kasungu	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	1	.	.	...	...
Mombera	...	...	...	...	...	...	...	...	...	...	...	..	...		..		..	...	...	..
West Nyasa	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	..	...	...	...	...
North Nyasa	...	...	...	...	...	...	74	189	2	12	1	1	...	...	17	2	...	...	...	..
Total			6,212	10,694	2,147	5,651	57	185	32	127	208	1,075	6,711	2,094	10	400	1,080	2,576

NATIVE AGRICULTURE, 1926.

District.	Seed. Cotton.	Rice.	Wheat.	Ground-nuts.	Tobacco.	Maize.	Peas and Beans.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Lower Shire ...	1,266	—	—	—	—	—	—
Chikwawa ...	571	—	—	—	—	—	—
Central Shire ...	165	—	—	—	—	—	—
Cholo	—	—	—	—	68	—	—
Mlanje ...	89	—	—	—	270	—	—
Blantyre ...	25	—	—	—	105	—	—
Chiradzulu ...	—	—	—	—	388	—	—
Zomba ...	—	—	—	—	121	—	—
Upper Shire ...	3	—	—	—	9	—	—
South Nyasa ...	12	—	—	—	10	—	—
Ncheu ..	34	—	—	—	66	—	—
Dedza ...	20	—	—	—	37	—	—
Fort Manning ...	—	—	—	—	—	—	—
Lilongwe ...	—	—	—	—	505	—	—
Dowa .	12	—	—	—	374	—	—
Kota Kota ...	—	—	—	—	60	—	—
Kasungu ..	—	—	—	—	—	—	—
Mombera .	—	—	—	—	—	—	—
West Nyasa ..	—	—	—	—	4	—	—
North Nyasa ...	—	—	—	—	5	—	—
Total	2,197	—	—	—	2,023	—	—

NOTE.—Maize is the staple foodstuff in most districts; groundnuts, rice, wheat, beans, and various other crops are also grown by natives for local consumption, but it is impossible to make an accurate estimate of the quantities of any of these crops.

NATIVE LIVE STOCK, AS AT 31ST DECEMBER, 1926.

District.	Cattle.	Sheep.	Goats.	Pigs.
Lower Shire	23	1,229	8,754	8,970
Chikwawa	110	927	2,472	5,000
Central Shire	468	318	2,187	858
Cholo	80	69	788	635
Mlanje ...	40	600	4,000	2,000
Blantyre	509	1,089	4,112	726
Chiradzulu	1,063	1,345	6,581	5,677
Zomba	450	2,000	7,000	250
Upper Shire ...	18	3,263	7,252	49
South Nyasa	951	15,225	15,527	7
Ncheu	7,142	5,223	27,657	12,860
Dedza	11,491	10,287	29,864	6,656
Fort Manning	1,170	2,529	3,716	1,532
Lilongwe	10,500	14,000	38,000	4,000
Dowa	14,000	25,000	25,000	4,000
Kota Kota	1,300	1,600	2,100	300
Kasungu	3,967	2,459	2,656	—
Mombera	29,633	5,300	11,680	51
West Nyasa ...	4,300	600	1,600	—
North Nyasa	26,964	900	3,000	—
Total	114,179	93,963	203,946	53,571

LIVE STOCK OWNED BY EUROPEANS AT 31ST DECEMBER, 1926.

District.	Cows and Heifers over 1 year.	Bulls.	Oxen.	Calves.	Pedigree Cattle.	Horses.	Mules.	Donkeys.	Sheep.	Goats.	Pigs.
Lower Shire	1,008	26	693	478	1	...	...	5	73	121	19
Chikwawa	391	19	361	356	2	...	...	12	12	32	41
Central Shire	56	7	79	26	...	...	...	5	12	...	23
Cholo	1,278	49	1,680	610	...	...	3	37	226	23	241
Mlanje	910	28	776	359	...	...	...	7	182	191	14
Blantyre	1,306	40	1,139	518	2	1	2	35	106	45	122
Chiradzulu	738	19	648	358	2	...	...	20	53	...	50
Zomba	1,251	31	1,575	507	15	1	2	59	229	27	77
Upper Shire	...	...	...	...	...	...	...	..	23	23	11
South Nyasa	97	19	70	42	...	...	...	1	92	132	...
Ncheu	393	18	250	236	...	...	...	9	42	35	211
Dedza	534	28	680	325	1	...	2	68	102	12	93
Fort Manning	137	1	88	7	...	...	...	8	15	12	28
Lilongwe	215	6	134	91	1	...	...	16	10	15	54
Dowa	71	5	58	37	...	1	...	18	62	20	32
Kota Kota	24	1	5	9	...	...	...	...	...	3	...
Kasungu	...	...	...	...	...	...	...	...	...	...	...
Mombera	14	2	7	6	...	...	...	3	...	...	1
West Nyasa	10	1	1	1	...	...	...	...	...	...	...
North Nyasa	111	7	126	51	...	...	...	7	47	...	45
Total	8,544	298	8,370	4,017	24	3	9	310	1,286	691	1,062

List of Publications, 1922-1926.

1922.

Circular No. 1, "A Satisfactory Type of 'Nkokwe'" (out of issue), Colin Smee, D.I.C., F.E.S., Entomologist.

Bulletin No. 1, "The Storage of Grains," do.

,, No. 2, "Agricultural Seeds and their Improvement," E. W. Davy, Assistant Director of Agriculture.

1923.

Circular No. 2, "Spraying Tobacco Seedbeds," Colin Smee, D.I.C., F.E.S., Entomologist.

,, No. 3, "Manuring of the Tobacco Crop," A. J. W. Hornby, B.Sc. A.I.C., Agricultural Chemist.

,, No. 4, "Tobacco Beetle," Colin Smee, D.I.C., F.E.S., Entomologist.

,, No. 5, "Management of Tobacco Seedbed Soil," A. J. W. Hornby, B.Sc. A.I.C., Agricultural Chemist, and F. Barker, C.D.A., Agriculturist.

Leaflet A, "Sterilization of Tobacco Seed," Colin Smee, D.I.C., F.E.S., Entomologist.

,, B, "Fumigation with Hydrocyanic Acid Gas," do.

,, C, "Eelworm or Root Gallworm," do.

,, D, "Value of Manures," A. J. W. Hornby, B.S.c, A.I.C. Agricultural Chemist.

,, E, "Soil Types," do.

,, F, "Poison Baits," Colin Smee, D.I.C., F.E.S., Entomologist.

,, G, "Arsenical Sprays," do.

,, H, "Paraffin Emulsion," do.

,, J, "Tobacco Extract," do.

Bulletin No. 3, "Plant Diseases," do.

1924.

Bulletin No. 1, "The Destruction of Vegetation and its Relation to Climate, Water Supply and Soil Fertility," A. J. W. Hornby, B.Sc., A.I.C., Agricultural Chemist, F. Dixey, D.Sc., F.G.S., Government Geologist, and J. B. Clements, B.Sc., Chief Forest Officer.

,, No. 2, "Likangala Soil Series," A. J. W. Hornby, B.Sc., A.I.C., Agricultural Chemist.

1925.

Bulletin No. 1, "High Level Lateritic Soils," do.

,, No. 2, "Use of Lime on Soils," do.

,, No. 3, "Crops for Green Manuring and Soil Protection," E. W. Davy, Assistant Director of Agriculture.

Leaflet July, "Legislation for the Control of Plant Pests and Diseases," Colin Smee, D.I.C., F.E.S., Entomologist.

1926.

Agricultural Series: Leaflet No. 1, "The Cultivation of Sunn Hemp under Nyasaland Conditions," H. C. Ducker, B.Sc., N.D.A., Cotton Specialist.

Agronomic Series: Bulletin No. 1, "Tobacco Culture,"* A. J. W. Hornby, B.Sc., A.I.C. Agricultural Chemist.

Leaflet No. 1, "Soil Acidity Tests," do.

,, No. 2, "Prices of Fertilizer," do.

,, No. 3, "New Seedbed Covers," do.

*Price 3s. 6d. per copy.

Report of the Chief Veterinary Officer

STAFF.

There has been no change in the European veterinary staff during the year 1926. In addition there are 28 native veterinary field assistants, one native clerk, eight policemen and 35 dipping tank labourers. Mr. S. Anderson, M.R.C.V.S., returned from leave on January 21st; Mr. J. de Meza departed on leave on 23rd January and returned 1st September; Capt. J. M. Culhane, M.R.C.V.S., departed on leave in October; the Chief Veterinary Officer and Mr. E. C. Holt, Stock Inspector, were on duty during the whole of the year.

The training of the African staff has been continued with, and more assistants than formerly are now available for field work.

The distribution of the European staff was as in the preceeding year, viz., the Chief Veterinary Officer at headquarters at Zomba; an officer in charge of the Southern Province with headquarters at Blantyre; an officer in charge of the Central and Northern Provinces with headquarters at Dowa; and the Stock Inspector stationed at Karonga in charge of the precautions against rinderpest in the North Nyasa district.

Every district in the Protectorate has been visited during the year. The number of miles travelled by the European staff on motor-car or motor-cycles was 11,776, in addition to which several long journeys were made on foot and several voyages taken on Lake Nyasa.

CONTROL MEASURES.

The system of permits for the control of movements of cattle has been in force during the whole year, and the compulsory dipping of all cattle when moving along roads has been maintained. Dipping by private owners has become more and more popular during the last few years, and practically all European-owned cattle are now dipped. During the year, the Government constructed two further dipping tanks in the Central Province, at Fort Mlangeni and Dombole. These tanks are now working and form additional links in the chain of tanks from the Central to the Southern Province, lessening the danger of introducing such diseases as "East Coast Fever," etc.

The number of animals passing through Government dipping tanks during the year was: cattle, 196,550; sheep and goats, 6,886. These figures shew an increase over the year 1925 as follows: cattle, 44,666; sheep and goats, 1,700.

The number of animals passing through the Government quarantine stations during the year was: Zomba (cattle), 272; (sheep and goats), 127. Blantyre (cattle), 708; (sheep and goats), 1,601.

All dipping tanks, Government and privately owned, are periodically inspected, and samples of dipping fluid from each tank are tested as to strength. The number of samples tested during the year was 336.

As in the previous year, all meat at the Zomba, Blantyre and Limbe abbatoirs was inspected by the Veterinary Department. During the year the number of carcases examined were: cattle, 1,157; sheep and goats, 5,199; pigs, 209. These figures shew an increase over the preceeding year (except pigs) as follows: cattle, 252; sheep and goats, 723.

The number of letters dealt with during the year was 3,731 (Zomba and Blantyre). The number of permits issued for the movement of livestock was 1,680.

LIVESTOCK.

The increase of livestock generally during the year must be considered very satisfactory, as the following figures shew: —

	Cattle.	Sheep.	Goats.	Pigs.
1925	135,432	95,249	204,637	54,638
1926	124,038	83,675	182,594	47,492
Increase ...	11,394	9,374	22,043	7,141

It will be observed in another paragraph that the number of cattle, sheep and goats slaughtered during the year has increased considerably. Although a few more animals may have been slaughtered to meet the requirements of the European population, by far the greater portion of this increase has been the result of the native demand for meat. The consumption of meat by natives, more especially of course by educated natives, is increasing rapidly. This is most noticeable in Blantyre, the industrial centre of the country, where there is a big population of African clerks, etc., employed by the big trading companies. It is noticeable that the supply of cattle for the native market falls below the demand, especially during times when for any reason permits to import animals from the Central Province are withheld. The native butchers are now prepared to buy as good a beast as the market can supply, and are willing to pay first-class prices. Formerly the native butchers were content to wait until cattle were brought to Blantyre for sale. At the present time, should any shortage occur, they at once proceed to outlying districts to purchase. The trade must be regarded as flourishing. This state of affairs should have a very beneficial effect on cattle-breeding in the Central Province, from where practically all cattle for butchery are imported.

The demand for working cattle by European planters in the Shire Highlands becomes larger every year. Here again there is a demand for cattle from the Central Province. Unfortunately East Coast Fever must now be regarded as enzootic in the greater part of the province, and it is often impossible to issue permits for the export of cattle for any other purpose except slaughter. However, the number of dipping tanks are being steadily increased year by year. Several areas

now exist in which all cattle are dipped regularly. These areas should and will gradually expand until the whole province is under systematic dipping. It will then be possible to stamp out East Coast Fever and other tick-borne diseases. When this has been obtained it will be possible and profitable to import graded bulls. These bulls, distributed among the village herds, will improve the stock greatly. The improvement of stock in the Central Province will be felt all over the Shire Highlands. There is an increasing desire among natives in the Shire Highlands to possess cattle, and the number of educated natives who now own a few cattle, especially in the Blantyre area, is very noticeable. Every encouragement has been given to such owners by the Veterinary Department, and advice and help can always be obtained. A pamphlet, translated into the vernacular, has been written by Mr. de Meza for the education of natives in the more simple principles of hygiene and husbandry, and also on the ailments more frequently met with amongst stock, together with their treatments. This pamphlet is being used by the Scotch Mission.

Diseases of Cattle.

Rinderpest.—There has been no outbreak of this disease during the year. At Mbozi, in Tanganyika territory, 25 miles from our northern border, an outbreak occurred during January. This necessitated the employment of extra police guards, and a veterinary officer was placed in charge of the district until all danger from the spread of the disease was over.

Special camps have been built. These are placed in central positions and are permanent. In these camps is stored the supply of anti-rinderpest serum and apparatus necessary for inoculating large numbers of animals. By these means it is hoped that it will be able to deal rapidly with an outbreak, should such occur on the Nyasaland-Tanganyika border.

Trypanosomiasis.—The situation as regards this disease still gives rise to grave apprehension. The areas under tsetse fly continue to spread, and the number of deaths resulting continues to increase. The extensive outbreak in the Lower Shire and Chikwawa districts which occurred last year still exists, and numbers of deaths amongst cattle have taken place.

Losses are still reported from practically every district in the Protectorate. In North Nyasa district a large number of cattle were lost on account of imported cattle being infected *en route*, the infection then being transmitted by blood-sucking flies to animals that had been on the estate for a considerable period of time. This method of infection still continues to cause outbreaks of the disease and is difficult to control. It is often impossible with certainty to discover where the original infection by the tsetse occurred. Treatments by means of intravenous injections of tartar emetic are still being persevered with, and fairly satisfactory results obtained, but it is as well to emphasise the fact that injections of tartar emetic do not constitute a cure, and animals which have to all appearance recovered very often relapse with rapidly fatal results should unfavourable conditions occur. Good feeding and rest during the period of injections is essential to favourable results.

East Coast Fever.—No outbreaks have occurred during the year in the Southern and Zomba Provinces. In the Northern Province the disease is enzootic and deaths occur each year, especially among calves. In the Central Province no fresh outbreaks have been observed, but the disease must be considered enzootic in this area.

Redwater Fever.—Isolated cases have been met with during the year, but the native cattle usually shew a well-marked resistance to this disease. This resistance or immunity is probably due to the fact that calves are naturally more resistant to redwater fever than adults. Young stock, when attacked by infective ticks, contract a very mild form of the malady, from which they recover quickly and acquire a strong degree of immunity which is life long.

However, as dipping becomes more and more widespread in the Protectorate it is possible that calves will not be subjected to this immunizing process because of the absence of ticks. It is therefore likely that adult cattle, should they be imported or taken through areas where dipping is not general, may contract redwater.

Chronic Anæmia (*T. Mutans*).—This disease has caused losses amongst young stock in the Shire Highlands, especially during the latter part of the dry season, when pasturage is scarce and of very poor quality. The presence of intestinal parasites greatly aggravates this condition. Internal parasiticides and augmented feed is usually sufficient to effect a cure.

The blood parasite which causes this disease (*T. Mutans*) is tick-borne, but it is uncertain which is the actual tick concerned (probably *Boophilies annulatus* or *Rhipicephatus simus*). However, since the disease is certainly tick-borne it is essential that regular dipping of all stock, young as well as old, should be carried out.

Anaplasmosis (*Gall Sickness*).—Cases of this disease have been met with during the year. The condition is not usually serious if regular dipping is carried out. The disease is often seen together with redwater fever, and when such is the case the result is more serious.

Anthrax.—Four cases in bovines have been definitely diagnosed during the year.

Blackquarter.—No cases have been diagnosed during the year.

Seasonal Gastro-Enteritis (*Grass Sickness*).—Cases of this disease occur all over the Protectorate. The treatment as laid down in former reports (15 grains of permanganate of potassium in saline solution 1-20) has given very good results and is now generally used in the southern districts. Undoubtedly, many deaths occur from this disease in the Central and Northern Provinces, especially the latter, and owing to the proximity of the Tanganyika border these deaths are apt to cause anxiety, as it is often impossible to visit the villages where deaths have occurred until it is too late to make a definite diagnosis. The ever-present threat of rinderpest makes the undiagnosed deaths in the border areas very unsatisfactory, and this uneasiness is aggravated by the difficulty of obtaining from natives reliable descriptions of symptoms.

Demodectic (*follicular*) *Mange.*—This disease still persists in the Central and Northern Provinces and will continue to do so until dipping becomes general. In the Southern and Zomba Provinces it is rarely met with. Three outbreaks were diagnosed in the Southern Province during the year, in one of which some thirty animals were affected.

Tuberculosis.—Two cases of bovine tuberculosis were diagnosed in carcases exposed for sale.

Distoma Hepatica.—This condition continues to be met with in a very large number of cattle on which post-mortem examinations are made.

Cystercercus Bovis, Bovine Measles.—No cases have been observed. The disease is of very rare occurrence in Nyasaland.

Sheep and Goats.

No diseases of sheep and goats have been reported during the year. Infections of *Stilesia Hepatica* are met with in from 60 to 70 per cent. of all livers examined.

Pigs.

There has been no outbreak of swine fever during the year. Several cases of *Cystercercus Cellulosæ* have been seen.

Poultry.

Outbreaks of fowl cholera have been severe among native-owned birds in the Blantyre district. Bacterial Diarrhœa has been present during the year in the Southern Province.

Diseases of Dogs.

Piroplasmosis.—This disease continues to be of most frequent occurrence. It would seem to be the case that practically every dog contracts the malady. Few animals die if treated in good time.

Rabies.—This disease has occurred with greater frequency than in former years, and the number of cases reported gives rise to anxiety. Two cases of Europeans being bitten by rabid dogs have occurred during the year, necessitating vaccination treatment. Six cases have been definitely diagnosed during the year.

Skin Diseases.—These have been much more frequently met with during the year and many European-owned dogs have been treated.

Canine Typhus.—The number of cases of this disease is on the increase.

Routine Laboratory work has been carried out during the year at Blantyre and Zomba.

J. de Meza,
Acting Chief Veterinary Officer.